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PART I.—PRINCIPLES AND TREATMENT.

THE contributions made to surgical science by Great Britain in the last hundred or hundred and twenty years have placed the world for ever under a debt to the savants of this country. The discovery, about the year 1799, by Sir Humphry Davy that anaesthesia could be induced by vapour inhalation and the suggestion that nitrous oxide might be used with advantage during surgical operations;[1] the introduction of the antiseptic system by Lister, and the publication of the *Origin of Species* by Darwin which firmly established the principles of the law of evolution—these all effected a complete revolution on medical thought both as regards its theory and its practice. To show how great the revolution was a reference may be made to Lister's papers and more especially to the year 1873.[2] At that time a Scottish medical student was receiving his training in surgical wards from which hospital gangrene, blood poisoning and erysipelas had been banished, and he was witnessing operations under chloroform anaesthesia, the mortality from which in Syme's first series of 5,000 cases was *nil*. In anatomy not only could he, like Hunter, study man in relation to the animal world, but, thanks to the genius of Darwin, could study each animal in its sequence to some other. The law and order of function and structure took the place of chaos.

It is interesting to note that about that time a commission was sent to Edinburgh from Germany under Lindpainter. The wards of the hospitals of that country were foul with sepsis, and the magnificent hospital in Munich was about to be destroyed owing to the prevalence of blood poisoning, 80 per cent. of all wounds being affected by hospital gangrene. From this country, after a year spent in acquiring principles and methods, the German Commission took away a sound knowledge of the antiseptic system, anaesthesia, and of comparative biology—the three factors to which modern surgery owes its existence. After Lindpainter's return from Edinburgh not a single case of hospital gangrene occurred in the Munich Krankenhaus, and pyaemia and erysipelas were banished.

The effects on surgery of the introduction of the antiseptic—or, as called later, the aseptic—system were immediate. Its greatness was recognized throughout the world, and everywhere surgical wards and operating theatres were modelled on the British principle. The cranium, thorax, and abdomen could now be explored, and cases always regarded formerly as hopeless were rendered curable.

Unfortunately, the simplicity and power of the antiseptic system was not unassociated with danger. It placed a force in the hands of men who were apt to forget that a knowledge, if not of comparative, at least of human anatomy was the essential basis of all surgical treatment. If Lister regarded surgical treatment as largely a question of asepsis, it was because he recognized sepsis as surgery's curse, against which he bent his titanic energies, and over which he finally triumphed. Listerism was associated with action. In itself it did not convert the practice of surgery from an art into a science.

Why Britain's contribution to surgery stands unequalled is that not only did it introduce to the world the antiseptic or operative system but also its complement—the conservative system. Not only did it offer the world a system by which, for example, a tuberculous joint could be excised or explored without risk of sepsis, but also a method by which the joint, treated conservatively, could be absolutely cured. This complement we owe to a Welshman whose greatness is now only beginning to be generally recognized, and whose life, "teeming with good deeds done," was prematurely cut off at the early age of 57. I allude to Hugh Owen Thomas of Liverpool, of whom Professor Steele, the eminent American orthopaedic surgeon, in his oration on Thomas delivered before the Orthopaedic Congress at Washington,[3] said: "In orthopaedic surgery more of originality and practical therapeutic suggestion has been given by no one. I have greatly enjoyed perusing his works, and it has not been without profit; I trust that what he has left in print will be found in the library of every member of our Association, for from no single source within our own times has so much of orthopaedic originality and suggestive practice emanated."

As Thomas's work was so bound up with the principles of muscular action, and as we recognize that the restoration of muscular function to the normal is the foundation of all orthopaedic treatment, whether active or passive—and this applies equally to injury of muscle, nerve, nerve centre, joint or bone—a reference is necessary to certain fundamental principles connected with nerve and muscle discovered in this country, so that the position of Thomas can be clearly defined.

Professor Keith has told us that Hunter devoted a large amount of his time to the study of muscle and bone, and first distinguished between nerves of ordinary sensation and nerves of special sense. Hunter's Croonian Lectures[4] on the physiology of muscular motion probably constitute his most important work. In studying movement not only did he go to the lowest forms of the Invertebrata, but also to the vegetable world, just as in investigating form he studied crystals. Hunter differentiated atrophy of muscle from disuse as well as from disease. He differentiated between velocity and force of action, and dealt with the adaptation of muscle to joint, and of muscles going over more joints than one.

He recognized that relaxation of muscle was a power as much depending on life as contraction, and not, as had been previously taught, a simple cessation of action. The state of rest he regarded as the state of inaction. "The elongation of a muscle is not the immediate result of its relaxation." Thus, if we take such an apparently simple movement as flexion of the finger, the stimulus which excites contraction of the flexors produces also a relaxation of the opponent extensors. The flexors by their contraction become the elongators of the relaxed extensors, and these relaxed and elongated extensors become by their subsequent contraction the cause of elongation of relaxed flexors. These two groups Hunter defined as "Reciprocal Elongators."

> These reciprocal elongators, then, by their mutual action on each other bring out a middle state between the extremes of contraction and elongation, which is the state of ease or tone in both. Either extreme of motion leaves the muscle in an uneasy state. We find, then, that as soon as any set of muscles cease to act, the elongators, which were stretched during their action, are stimulated to act in order to bring these parts into a state furthest removed from the extremes which were uneasy and by which the stimulus arising from both is equally balanced. The elongated state of a muscle is an uneasy state—a muscle, therefore, that is stretched, although in a relaxed state, is uneasy, and will contract a certain length to what is probably the middle state.

We recognize that a muscle which has relaxed and elongated *pari passu* with the contraction of its opponent cannot at the same time be in a state of contraction. If the extensor communis digitorum extended the two distant phalanges we could not have extension of the metacarpo-phalangeal joint with flexion of the interphalangeal joints. Yet we can readily perform this. Nor could we have extension of the interphalangeal joints with flexion of the metacarpo-phalangeal, yet this normally also can be performed. A muscle cannot at one time help the extenders and at another the benders. To allow the opponent flexors to act, it, as an extender, becomes relaxed and elongated. Then, in some extraordinary way, this relaxed muscle fibre is supposed at the same time to be contracted and shortened to help the flexors.

Following shortly after Hunter came the brilliant researches of Charles Bell, whose classical work on the nervous system undoubtedly forms the basis of our knowledge of the physiology of the subject. For his work on respiration alone Bell's fame could stand. But Bell did more than that. In his own words he thus describes his great discovery.[5]

> I have now only to add that my opinions and experiments have been followed up to the satisfaction of all Europe. It has now been acknowledged that the anterior roots of the spinal nerves bestow the

power of muscular motion, and the posterior roots sensibility. When the anterior roots of the nerves of the leg are cut in experiment, the animal loses all power over the leg, although the limb still continues sensible. But if, on the other hand, the posterior roots are cut, the power of motion continues although the sensibility is destroyed. When the posterior column of the spinal marrow is irritated the animal evinces sensibility to pain, but no apparent effect is produced when the anterior column is touched.

In the year 1832 Bell's experiments were followed by the discovery in London by Marshall Hall of the reflex function of the medulla oblongata and medulla spinalis. In addition to the three modes of muscular action previously recognized—namely, voluntary, that of respiration, and the involuntary—Marshall Hall recognized a fourth, namely, the reflex action.

> The first three modes of muscular action are known only by actual movements or muscular contraction. But the reflex function exists as a continuous muscular action, as a power presiding over organs not actually in a state of motion, preserving in some, as glottis, an open and in others, as sphincters, a closed form, and in the limbs a due degree of equilibrium or balanced muscular action.

Not only did Marshall Hall discover and define "reflex action" but recognized the reflex function as the source of equilibrium in the muscular system. His original paper, read before the Royal Society,[6] in which his experiments are detailed, should form part of the armamentarium of all orthopaedic students. Then will they recognize in true perspective the work of the minor satellites who have audaciously associated their names with side issues of this great discovery.

The basic principle of the study of anatomy during the time of the Hunters and the Bells was function. Largely through the influence of Cuvier in France and Owen in this country—although the latter was curator of the Hunterian Museum—the study of the functional system was superseded by that of the structural, and it is idle to deny that the descriptive method, with its pernicious examination backing, accounts for the negligence with which not merely comparative but human anatomy is studied. As Charles Bell himself wrote: "The one chief purpose in studying the anatomy of the human body is to understand its functions and to compare them with those of other creatures till we arrive at last at some distinct conception of the whole; of the various structures of animals and vegetables; and of the various functions which in each of these classes support life and action, and through it the principle of life."

With the publication of the *Origin of Species* and the placing of the Law of Evolution on an unassailable basis a new weapon for the study of function was placed in the hands of the medical profession. Function could now be studied from the point of view of correlation, and structure from the point of view of necessity. Yet even this mighty impetus has so far failed to slacken the hold of the descriptive system on the medical curriculum, although in the last few years there are all the evidences of change.[7]

Unfortunately the descriptive system received in the antiseptic system a powerful ally. Cleanliness, a knowledge of technique, and of position of the main bodily structures, have for the last half-century constituted the main armamentarium of the operating surgeon.

To concentrate our attention on function as embodied by conservatism was the ideal which H. O. Thomas formulated. For that ideal, unpopular then as now, he fought throughout his all too short life. It was a fight that required a man with giant energies and an unswerving belief in his own principles. With what contempt must the young surgeon have looked on Thomas, who, discarding the ease with which—thanks to anaesthesia and antisepsis—a joint could be excised, preferred to "cure" the joint by scientific rest. His death, just as in Hunter's case, excited little interest in his own country. Not so, however, in America and Australia, where the scientific value of his principles was well known. The mists of prejudice are now becoming cleared from men's eyes as it is realized more and more that Thomas's principles embody the application of the functional method to practice. This, after all, is the only scientific method, because it is founded on the basis of the true anatomy—namely, the biological or comparative.

Thomas made in all ten contributions to medical science, and of these the most important are *The Principles of the Treatment of Joint Disease*, and *The Principles of the Treatment of Fractures and Dislocations*. It is generally conceded that these principles are on the level of Hunter's Croonian Lectures.

Thomas can be regarded as the apostle of the conservative or rest treatment of joints, bones, and muscles—not surgical rest, so called, but anatomical rest. He knew, of course, that complete rest could only be attained *post mortem*. In his methods he aimed at effective immobilization, abolition of concussion, and avoidance of pressure.

To his medical knowledge he added a sound acquaintance with the principles of mechanics and mathematics. The keynote of his work is to be found in his knowledge of the physiology of muscular action. Thomas recognized that in inflammation of a joint the altered position relative to the normal which the parts comprising the joint assumed was due to muscular action and not to so-called increased tension. Increased tension he knew could not cause movement. He looked on muscles as sentries needing control but not structures to be forcibly stretched or subcutaneously divided, as was taught.

> Hip and other joint deformities accompanied by inflammation arise mainly from the effort of the patient by the exercise of his will to pose the limb in the easiest position and fix the articulation, without which ease could not be gained. Knee-joints are not infrequently presented to the surgeon suffering from liquid distension only, which the muscles appear to know, for there is an absence of any deformity as there is no special muscular intervention. The articulation, however, is fixed more effectively by art than by the natural method of muscular action. In fact, a through fixation of a diseased joint is a physical method of physiologically suspending or disconnecting for a time muscle influence from a joint, and this inhibition of muscular interference will be the more complete just in proportion to the practical efficiency of mechanical aid.

Rest of the joint was secured by controlling all the muscles which produce or tend to produce movement. He rested the joint in the position naturally assumed in the inflamed condition owing to muscular action, the deformity being reduced gradually as the joint recovered. He gave relief to the unhealthy portion by action on the healthy—that is, he attached his controlling appliance to the sound portions only of the limb to which the diseased articulation belonged, and not as was usually advised to the diseased part, inasmuch as he knew that in this way the diseased area was subjected to pressure. Traction in the line of deformity he knew would be endless traction and that it was impossible for a flexed hip-joint to have its angle from the plane reduced if the traction were constantly at that angle.

> No matter what the primary cause of the disease in a joint, whether it be induced by trauma, struma, syphilis, gonorrhoea, or rheumatism, rest cannot be dispensed with, for, if surgery does not step in, Nature is sure to intervene by the muscular method, knowing that arrest of motion is the one thing needful before all others. In man's evolution it was his only chance of recovery from hip-joint inflammation.

It was his practice when treating a diseased articulation by enforced rest never to test for motion so long as resolution of the disease was not seemingly established, and then in the gentlest manner possible. No amount of rest, he knew, would produce ankylosis in a joint free of disease. It might produce stiffness, which is only a trivial and temporary hindrance.

Between a stiff and an ankylosed joint is no analogy beyond the absence of motion. His views on ankylosis of joints are noteworthy, and were years ahead of his time.

> In the condition of diseased articulation we find inflammation and the accident attendant on it—namely, deformity. To the treatment there can only be applicable the principle that the most perfect and continuous practical immobility should be enforced so long as unsoundness is known to exist. To this principle there is no exception. The more completely an unsound joint is maintained at rest, if the rest arrests friction and removes pressure, the sooner it will become sound and able to endure pressure and

friction, the probability of ankylosis remaining is diminished, but if ankylosis results—and it cannot always be avoided—it should be accepted not as evidence of defective treatment, but rather as an indication of the intensity of the disease. The purpose of treatment should not be to induce ankylosis, as is so often done under the supposition that such a limb is better suited to the wear and tear of use, or that relapse and recurrence were not so liable to happen if ankylosis of an articulation occurred. An unsound ankylosis is quite as liable to retrogression with motion as an unsound joint. Deformity is evidence of Nature's attempts to secure rest for the articulation by fixation of the joint. It is Nature's mode of immediate help. Ankylosis is Nature's reserve assistance. Ankylosis prepares to fix the joint when the method by muscular control begins to fail. The surgeons of the past judged deformity to be an unavoidable defect, and ankylosis as often a necessary evil. But deformities are avoidable, and ankylosis is in no instance to be desired, though it may be in the presence of certain conditions an unavoidable termination. The fact that there has hitherto been no sure test of recovery has led to the belief that joints which have been excised are less prone to subsequent trouble from recurrence of unsoundness. It has always been a favourite argument that without excision the diseased joint is the subject of frequent and unexpected relapses, whereas the real cause of relapse has been the fact that treatment was in past time suspended ere soundness of the articulation had been secured.

Thomas was careful to distingnish clinically between healthy, inflamed, ankylosed inflamed or unsound, ankylosed but sound, sound or recovered, and deformed joints.

In an unsound ankylosis progressive and evident motion will follow use if the limb in which the ankylosis exists be employed for its usual purpose, while in an ankylosed but sound articulation ordinary daily use cannot bring on any variation of position, an indication that such condition should be termed true ankylosis. An inflamed joint is an articulation the radius of action of which is gradually diminishing. The diminished radius of action designated joint deformity tends to increase so long as the joint is unsound and untreated, and is caused solely by the efforts of Nature to practise immobility as a means towards aiding restoration. A sound or recovered joint is one from which traces of previous inflammation have passed away. In evidence of this sound condition and complete recovery it is noticed that by ordinary daily use the radius of action to and from the position maintained during treatment is seen to be gradually increasing no matter in what position the limb may have been fixed during treatment—an infallible sign of soundness and a justification for no further restraint or surgical interference.

He protested against the terms true or bony and false or fibrous ankylosis.

The expression false and true ankylosis should refer to the permanency of the rigidity, not to its structure; that is, no ankylosis which will vary either by test or use should be termed true ankylosis and no ankylosis which remains immovable by either test or use should be termed false ankylosis. As long as false or unsound ankylosis lasts there is always a prospective chance of recovery with complete or some motion by use alone.

He was careful to insist on a utilitarian position should ankylosis be inevitable. At the elbow flexion not extension; at the hip and knee extension; at the ankle with the foot at a right angle; at the wrist dorsiflexion, ordinary flexion giving a weak finger grip in grasping. In vehement terms he denounced the breaking down of contracted joints, a practice which unfortunately is still followed by the ignorant.

Joints that have perfectly recovered either from injury or disease regain motion earliest by their being employed in their ordinary manner. Joints that are not in a healthy condition automatically resent attempts at compulsory employment. Passive motion applied to joints injured or diseased delays recovery, and if applied to joints cured it delays the event of complete restoration of function. The good repute which the public has given to bonesetters, osteopaths, passive motionists, shampooers, manipulators, and Bethshanites rests upon the fact that these unscientific practitioners get the charge of joints and fractures when their cure has been consummated and merely preside during the resumption of function. They only watch the rising sun and profess to assist its cure practising certain flexions, extensions, twists, jerks, and pushes, with passive motions and other details evidently intended to give proper dignity and importance to their proceedings. The treatment, however, which the sufferer is most in need of he seldom meets with—namely, no motion. As soon as the part under treatment has become healthy it will resume its function more fully and readily rather by the attempts of the late patient to use the part than by supplemental violence, such as passive motion or violent manipulations. If the part be sound its range of function increases with use. If ankylosis can possibly wear off it does so best by the patient's attempts at ordinary use of the part.

Treated on the above principles, he confidently asserted that every case of hip-joint could be cured without leaving a fractional deformity of flexion, and consequently without any shortening except that arising either from the arrest of growth where inflammation has interfered with the growing points in the upper part of the femur or from erosion. He asserted the same as regards the treatment of knee-joint disease. He was a bitter opponent of the indiscriminate excision of joints.

Joints injured or diseased when they show no signs that may lead us to think they can recover, should be amputated. My contention has been that the joint that can recover after excision can recover without it, and joints that do not recover after excision ought to have been removed by amputation.

He never once excised an elbow-joint, and states:

I have never met with a case of excision of the elbow which equalled in usefulness a diseased elbow-joint truly cured. Even if ankylosis remain, the part, if sound, is less liable to relapse or give future annoyance to the patient than after an excision, however successful.

That has been the experience of Peter Bennie, the distinguished Australian surgeon, during thirty years' application of Thomas's principles. "I have never," he writes, "seen a case in which amputation for hip disease was necessary, and if the joint is properly fixed by a Thomas hip splint excision will never be required."

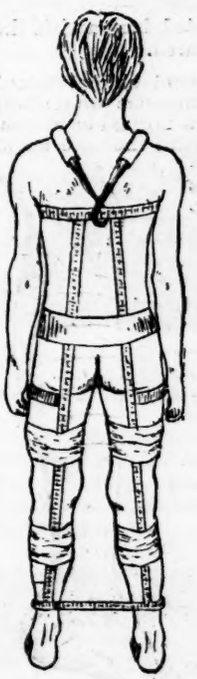

FIG. 1.

FIG. 2.

FIG. 1.—The double Thomas hip splint applied. (After Thomas.)

FIG. 2.—The caliper knee walking splint. (After Thomas.) E, Ring at upper thigh. B, Band behind knee. A, Band behind lower third of leg. F, Inserted into socket in boot heel.

To put these principles into practice Thomas introduced to the profession many ingenious appliances, of which the best known are the hip or dorsal fixation splint and the knee splint, the varieties of which are the "bed" for resting and the "caliper" for walking, which latter, by transmitting the weight from the hip to the heel, enables the patient to walk with the knee at rest. The knee splint has been the most universally used splint in the war. The hip splint, though quite simple in construction, is probably the least understood of all his splints; this, however, is the result of prejudice and of ignorance of principles both of mechanics and of rest. It is the only splint in the world whose application has been raised to a science. I allude to P. B. Bennie's formulae

for the accurate fitting of the splint and the correction of deformities. One formula is:

$$Sin\ \theta = \frac{cos\ \alpha,\ sin\ \beta}{\sqrt{(1 - cos^2\alpha,\ cos^2\beta)}}.$$

Where θ = angle through which the plane of the splint is rotated in the direction of the lateral displacement, α is the angle of flexion required calculated from 0° as normal, and β the angle of adduction or abduction, the rotation being made just above the joint and the flexion opposite the joint.[8]

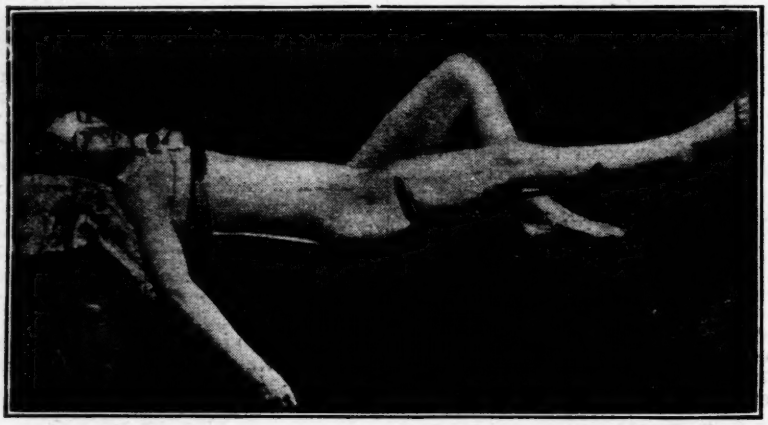

Fig. 3.—Effective rest of right hip-joint by Thomas's dorsal fixation splint. (After Bennie.)

For elbow flexion Thomas used a halter and collar; for the wrist a simple tin splint to hold the joint in the position of dorsi-flexion; for the dorso-lumbar spine a cuirass; for cervical disease a leather collar; and for ankle disease the simple "crab" splint.

Thomas's work on fractures is pregnant with original ideas. A brief mention may be made to some important

Fig. 4.—The combined hip and ankle splint illustrating a simple means of resting hip, knee, and ankle joints.

principles. Efficient fixation, he asserted, best assists the restoration and repair of the part fractured.

Perfect rest of a fracture, if it could be maintained without supplemental art and interference would best permit the repair of fractures up to a normal condition. If a fracture is in proximity to a joint the limb ought to be so fixed that the utmost prospective usefulness may be afterwards gained should the joint have also suffered an injury indirectly.

In fractured olecranon he merely advised the extended position, but if the fracture were compound, flexion, he said, should be maintained during treatment lest the injury may run a course ending in the loss of motion of the joint.

He was careful to distinguish between non-union after fracture of bone and delayed repair.

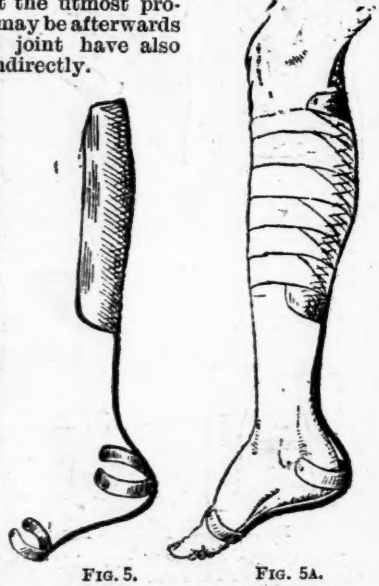

Fig. 5. Fig. 5A.

Fig. 5.—The simple "Crab" splint for resting the ankle and foot.
Fig. 5A.—The same applied. (After Thomas.)

Non-union should apply only to those fractures which have resulted in a cartilaginous, or otherwise, connexion having formed between the points of fracture—the bony points not being in actual contact. Examples of delayed repair are common, while those of non-union are rarely met with. The gravity of delayed repair depends on the locality. If found in the shaft of a bone it is not so easily remedied as when it occurs at an extremity.

He states that in the early years of his practice he invariably interfered with instances of delayed repair by saw, wire, rasping, and pegging, but during the later years he succeeded better without direct interference, although most of his cases were less hopeful of success than his earlier cases.

In these days of antisepsis it is not uncommon for even a recent fracture, especially if compound, to be at once drilled and wired or pegged, when ordinary mechanical appliances intelligently used would be better. This practice I hold to be a retrogression in the surgery of fractured bones; indeed, if we are more thoughtful of the fact that it is living matter that we have to manage, then it would seem that even in delayed union of fractures actual interference, such as drilling and excising, will seldom be required—nay, it will be found that such operations are in some instances a hindrance rather than an aid to repair, and operations of this character would then be reserved for old chronic cartilaginous connexions only.

He preferred to give cases of delayed union conservative treatment before operating—stimulating the part by compression and percussion combined with efficient fixation of the fractured area. At first he did not regard efficient fixation as essential, but later insisted on it as he found the time for repair shortened. By this mode of treatment he was invariably successful. Percussion was applied with

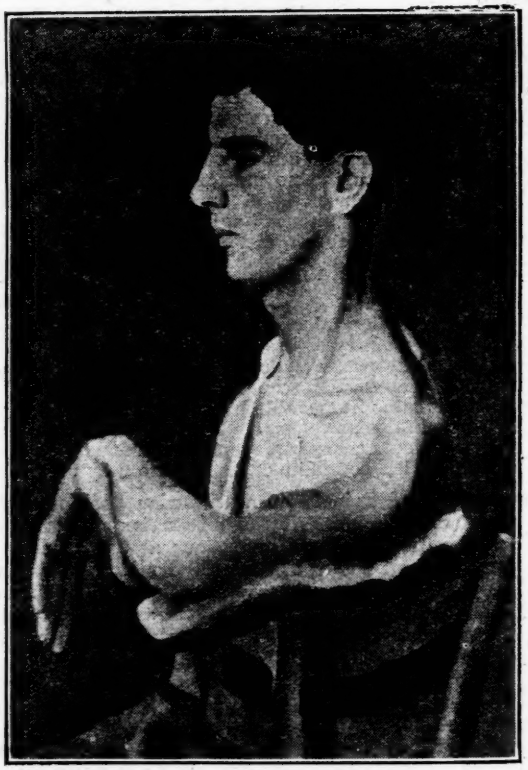

Fig. 6.—Gunshot wound of upper end of left humerus rested on upper limb abduction splint.

a rubber-protected mallet all round the site of fracture—the skin being protected by felt—about every third day for four weeks. Prolonged tumefaction for a distance around, above and below the fracture, was enforced by means of rubber bands. In a case of ununited fracture of

the humerus of nine months' standing, which he treated successfully, he practised percussion weekly for four weeks and practised daily for half an hour "damming" the circulation around the fracture. It is interesting to note that he regarded percussion as a means of bringing about an increase of bony structure even in cases of non-fracture. It is important to remember that Thomas was the originator of the congestive or hyperaemic treatment, although it received little notice in this country till associated with the name of a foreign surgeon.

Muscle.

Thomas's important contribution to the surgery of nerve and muscle is that associated with the treatment of dropped wrist. More important than that, however, is his explanation of so-called contracted muscle and contracted tendon:

> The term contracted muscle is a misnomer—a shortening of true muscular tissue from long-continuous action does not occur. Neither true muscular nor true tendon structure, as long as it is not diseased, can be shortened or lengthened. During the action of true muscular structures the fibrous ramifications radiating from the tendinous origins and insertions of muscles and connecting the true muscular structure become wrinkled, and if the true muscular tissue remain long and continuously active the folds of fibrous tissue become obliterated; and when the true muscle is tired out the contraction of this tissue acts to mechanically fix in a special position the part subjected to the control of that muscle.

This, together with alterations in the form of and around the articular capsule and possible connexions between the bones forming the joint he regarded as the factors maintaining the permanency of joint deformity. As a clinician he noticed that muscles possessed of much divergent fibrous tissue, as soleus and gastrocnemius, are the most prone to permanent and obstinate contraction, while much permanent rigidity of muscle is seldom met with in such a muscle as the sartorius, which possesses little fibrous tissue, except at origin and insertion. As further evidence, he regarded the fact that the true muscle of a tendon that has been severed will resume duty in a few days. An unhealthy condition of a joint and the necessity to place the components in the position of ease, constituting deformity, become the stimulus to contraction of one set of muscles and to relaxation and elongation of the opponents. In a joint deformity we are always dealing with these two factors. This muscle state is maintained as long as the necessity persists, but the muscles themselves are not diseased. If the abnormal position be prolonged owing, for example, to the severity of disease, reduction may be interfered with by secondary changes—namely, contraction of the intermuscular fibrous tissue, alterations in the capsule or perhaps bony or fibrous connexions between the joint surfaces.

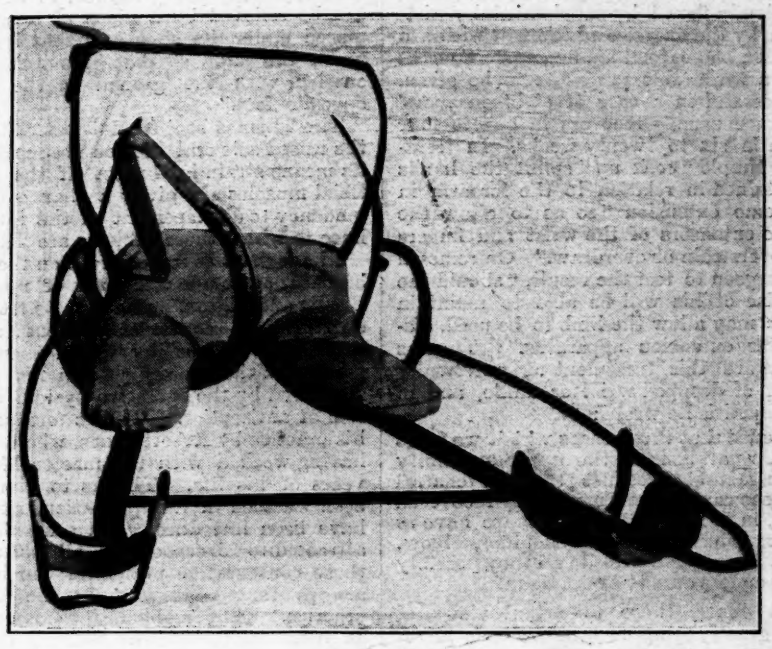

FIG. 7.

FIG. 7A.

FIG. 7.—The Robert Jones abduction frame. Used especially for old ankylosis of hip and to overcome shortening in malunion of femur. FIG. 7A.—The same applied.

Recognizing these factors and also that the deformity has been gradual in development—the contracting and shortening of one muscular group occurring *pari passu* with relaxation and lengthening of the opponents—such a procedure as forcibly breaking down a contracted joint must be condemned as absolutely unscientific and only worthy of charlatans.

Wrist-drop.

In the condition known as "wrist-drop," Thomas, instead of assuming that this was permanent and irremediable, argued that the primary cause may have been temporary, and that elongated extensors were mechanically prevented from contracting. They were not of necessity permanently paralysed and stretched. For purposes of prognosis he used a simple and effective test. "If the

FIG. 8.—Long plaster "cock-up" splint for musculo-spiral paralysis.

patient be asked to try and perform by the exercise of the will only greater flexion than already exists, the fingers flex readily, and also by the act of the will extend forward again to the position of previous repose." Furthermore, "while the wrist is firmly flexed by supplemental assistance the patient can by the exercise of his will within a small radius rapidly flex and extend his fingers." Success in these tests enable a favourable prognosis to be given, and Thomas was successful in a case of eighteen years' standing. A recent case usually recovers in one to four weeks and an old one in six to twenty weeks. In treatment by means of a simple "cock up" splint the hands and fingers are maintained in relation to the forearm in the position of extreme extension "so as to allow the muscular tissue of the extensors of the wrist and fingers to retract from the overstrain or overdraw." On removal of the splint by the surgeon to test the result, "should the patient by the exercise of his will be able to maintain extension, the surgeon may allow the limb to be used, discontinuing the angular extension apparatus." Thomas did not of course regard this treatment as universally successful in all cases of dropped wrist or ankle, and in connexion with poliomyelitis he wrote:

> It is my experience that those cases which we meet with after infantile paralysis of the upper extremity are the most untractable because that the central nerve lesion in these cases is never perfectly recovered from; and, again, in many of these cases we have to contend with a dropped condition of shoulder, elbow, wrist, and fingers in subjects who do all they possibly can to thwart our endeavours to assist them.

Thanks to Robert Jones, these important views of Thomas on muscle, greatly amplified, have been introduced to the notice of the profession, and it would be idle to deny that round them is being built up the modern surgery of nerve and muscle injury.

Nerve Lesions.

Thomas directed our attention to the treatment of muscle in cases of nerve injury. Weakened or paralysed muscles must be rested just as a diseased joint or bone must be rested. The healthy opponents should not be allowed to contract, producing a stretching of the weakened group. Such conditions as contracted fingers or joints should never be allowed to occur, and should they be present they should be remedied before any operation is undertaken. In recent cases of divided nerve, where the diagnosis is certain, a reparative operation is essential. In old cases it is surprising what improvement can be effected by means of rest, together with scientific re-education aided by the patient's volition. Speaking generally, no operation should be undertaken till these methods have been exhausted.

In cases of injuries of nerves the ends are freshened and sutured. If a gap exist between the divided ends it may be necessary to flex a joint—for instance, as the elbow—or alter the position of the nerve. Should these fail, the gap may be bridged by a long segment of a sensory nerve or by strands of catgut, but it must be remembered that such operative treatment is only the beginning. The mere transmission of an impulse along a sutured nerve is not sufficient to cause recovery of muscular action, and that is the important thing. The muscle must be rested and re-educated from zero. Its recovery must be along biological lines—that is, along the lines of the acquisition of its mammalian function.

Stimulated by the work of the Liverpool School of Orthopaedics, much research work has been carried out on the evolution of muscular function throughout the mammalia so as to form a scientific basis for muscle re-education. Furthermore, in cases of muscle transplantation to strengthen the weak, or muscle lengthening or division to weaken the strong, it is important to remember that certain muscles in the economy are "survival results," and that by the comparative method we are enabled to estimate the relative value for grafting—for example, of the two peronei or the two tibials, or the brachio-radialis.

In connexion with military orthopaedics it should be remembered that Thomas first introduced three simple methods of treatment which are now universally recognized.

He taught us that spinal curvature was frequently associated with inequality of length of limb, and that an essential in treatment was to raise the boot on the shortened side.

Inflammation of the metatarso-phalangeal joint of the toes, especially the great toe, to which soldiers are liable, can be relieved by a piece of hoop iron or leather "so placed under the shoe sole that its front margin is just under the joint, so that in marching the toes miss concussion with the ground as the patient advances the opposite foot."

The Thomas boot for flat-foot, with the oblique heel and the raised sole and heel on the inside, is well known. By its means strain is thrown off the inside of the foot, the tibial muscles are given a chance to strengthen, and the tendency to displacement of the internal cartilage of the knee to which these subjects are liable is obviated.

I have dealt at some length on the principles of Thomas because, although principles of rest were enunciated by Brodie and Hilton, he was the first not only to enunciate doctrines of conservatism but also to offer simple mechanical means by which these could be put into practice, although at his death his work was largely overshadowed by the operative system owing to the introduction of antiseptics. Thomas fortunately was succeeded in his practice by Robert Jones, who had the rare privilege of having worked with the master himself during the later years of his life. Thanks to him Thomas's work has been widened in its application, numerous improvements have been introduced, and scientific workers have been attracted to Liverpool from all parts of the world to learn those conservative principles which, like Thomas, he has always taught as forming the foundation of surgical practice. Thus in appointing Colonel Robert Jones, C.B., as Inspector-General of Military Orthopaedics, the War Office placed the treatment of the deformed soldier under the control of one who, himself trained in the modern aseptic school, is recognized as the greatest living exponent of the conservative method. In him the complemental schools of British surgery have been effectively combined. The British soldier who has suffered division of a nerve is assured not merely of a successful aseptic operation of suture, but of prolonged conservative treatment directed to the scientific stimulation and re-education of the affected muscles. Should these methods be unsuccessful, recourse may be had to the operation of muscle grafting, by means of which a flexor is asked to act as an extender and an extender as a bender as the result of alteration of muscle insertion.

A fractured bone, even if union be delayed, may be treated by various methods of conservatism, but should these fail resort may be had to the operative methods of pegging, bone grafting, and plating, for the advance in which department of surgery the profession is under a debt of gratitude to the genius of Sir Arbuthnot Lane. Should the femur be shortened it may be re-fractured and lengthened by the assistance of the abduction frame of Robert Jones. Joints, should they be deformed, are not forcibly torn down or excised, but gradually reduced, so that recovery in one set of muscles is always correlated to that of the opponents. By anatomical rest of joints and bones amputations of limbs are obviated; the soldier with a displaced fibro-cartilage of the knee, the replacement of which is always easy and usually spontaneous, is rested so as to allow rupture of the collateral tibial ligament on which it largely depends to repair, and when the patient resumes walking his boot is built up on the inside to prevent recurrence by relieving strain on the inside of the knee. Only in cases of recurring displacements due to an unrepaired collateral ligament is resort had to removal, which, as described by Robert Jones, is almost a minor operation. By means of the Thomas boot and simple manipulative measures the soldier with even a severe flat-foot can be treated successfully without operative interference which is reserved for extreme cases.

What a difference in the lot of the British soldier, treated in 1815, after Waterloo, by Sir Charles Bell, admittedly the greatest anatomist and surgeon of his time, compared with the treatment of 100 years later! It is hard for us to realize that Bell in his paper was dealing with scenes of only a century ago. In this short period of time, thanks largely to the genius of our countrymen—although we render homage to the names of Lavoisier, Lamarck, Cuvier, and Pasteur—the antiseptic system, anaesthesia, the conception of vaccine treatment, the placing of the physiology of

nerve and muscle on a sound basis, the publication of the *Origin of Species*, and the establishment of conservative surgical principles, have all been introduced. Without these no modern orthopaedic work would be possible. To these we must add *x* rays; and although we pay respect to Roentgen for his great discovery, we must always remember that the Crookes's tube was discovered in this country. We can recall with no little pride that these great discoveries have been freely given to the world for the benefit of humanity.

PART II.—STATEMENT AS TO MILITARY ORTHOPAEDIC HOSPITALS IN GREAT BRITAIN AND THEIR EQUIPMENT.

Orthopaedic cases comprise in one form or another a large proportion of the men invalided from abroad with severe surgical injuries.

Military orthopaedic cases are held by the Army Council to include the following:

(*a*) Derangements and disabilities of joints, simple and grave, including ankylosis.
(*b*) Deformities and disabilities of feet, such as hallux rigidus, hallux valgus, hammer toes, metatarsalgia, painful heels, flat and claw feet.
(*c*) Malunited and ununited fractures.
(*d*) Injuries to ligaments, muscles, and tendons.
(*e*) Cases requiring tendon transplantation or other treatment for irreparable destruction of nerves.
(*f*) Nerve injuries complicated by fractures or stiffness of joint.
(*g*) Certain complicated gunshot injuries to joints.
(*h*) Cases requiring surgical appliances.

These cases naturally fall into two groups—those whose disablement is only temporary and who after treatment will be fit for military service again, and those who are so disabled that they must inevitably be discharged from the army.

The wounded soldier receives immediate treatment in a general military hospital. If his case comes into the category of orthopaedics, as defined above, he is then transferred to one of the orthopaedic centres for special treatment.

If his disablement has been only temporary, he may be sent for after-treatment to a command dépôt until ultimate recovery and return to military duty.

Command Dépôt.

A command dépôt is officially defined as a convalescent camp equipped with facilities for electrical and massage treatment under medical direction, but mainly organized and controlled under purely military officers, with the object of hardening men by suitable exercises and graduated drill for return to active service at the front in a period of about six months.

The men live in huts. Beds are wooden forms with straw palliasses and military blankets. Ordinary diets only are given. The huts are heated by stoves.

The cases suitable for admission to a command dépôt are:

1. Men recovering from gunshot wounds not involving joints or nerves.
2. United nerves giving normal action to muscles.
3. Pott's fracture, Colles's fracture, with no ankylosis of joints.
4. Injuries to left hand not to such a degree as to prevent the use of a rifle.
5. Simple myalgia without obvious organic symptoms.

All scars should be firmly healed and not situated at points of regular pressure of equipment, for example, shoulder, scapula, waist.

Spinal injuries when there are resultant symptoms as headache or paresis; shell shock with the slightest tremor or mental impairment; paralysed limbs, drop foot or hand, and neuritis, are not considered suitable cases for admission.

The command dépôts are visited regularly by an orthopaedic surgeon, to help the staff in their choice of cases for orthopaedic treatment.

List of Command Dépôts in the United Kingdom.

Name of Command Dépôt.	Accommodation for Men under Treatment in Addition to Permanent Staff.	How Allotted.
Shoreham	5,000	Eastern Command.
Seaford	5,000	London District R.E.
Sutton Coldfield...	2,000	Southern Command.
Ballyvonare ...	4,000	Southern Command.
Tipperary	4,000	Irish Command and Eastern Command.
Randalstown ...	3,500	Scottish Command.
Ripon North ...	6,500	Northern Command R.A. (Regular and I.F.); Machine Gun Corps.
Alnwick	3,400	Northern Command.
Knowsley Park ...	4,000	Western Command.
Heaton Park ...	4,700	Western Command.
Eastbourne ...	2,000	Cavalry whose Reserve Regiments are in the Eastern, Southern, and Aldershot Commands; Yeomanry whose 3rd Line Units are in the Eastern Command. Army Cyclist Corps; South African Contingent.
Blandford	600	63rd (Royal Naval) Divisions (only).
Ampthill	877	For Infantry (Regular and I.F.) whose dépôts are situated in No. 9 District, preference to Bedfordshire soldiers.
Total beds ...	45,577	

The soldier who is permanently disabled and utterly unfit for further military service undergoes similar treatment in the general and orthopaedic hospitals, and is finally discharged and pensioned.

Curative Industries.

In each orthopaedic centre, besides surgical operations, massage, electrical treatment, hydrotherapy, and gymnastic exercises, a series of curative workshops have been established with successful and valuable results.

These curative industries serve a twofold purpose. First of all—and this is most important—they are directly curative by giving exercise, under the surgeon's control and supervision, to the affected part. They are also indirectly curative through their profound psychological influence upon the patient. Apathy and inertia are replaced by bodily and mental activity. In the second place, these industries enable a certain number of the men to acquire a craft or trade, by which they will become more valuable to the community by the increase of their wage-earning capacity after discharge.

A minor point that experience has shown very clearly is the monetary value to the institution of the work done, such as splint making, carpentering, painting, etc.

The curative workshops are an important evolution in the war. In each orthopaedic centre they form an essential part of the treatment, with local differences dependent on the character and staple trade of the district. For example, in Aberdeen a net-making industry has proved highly successful, and in Bristol basket making.

The permanently disabled soldier is not lost sight of after discharge from the hospital and the army. He then comes under the care of the Statutory (Pensions) Committee. He may be quite fitted for civilian employment, in which case he may at once resume his old trade or seek new employment. He may find a place in one of Lord Roberts's memorial workshops; or he may elect to undergo further training for a new craft or trade. The advantage of the establishment of curative industries in the orthopaedic centres becomes obvious. The technical schools of the country have placed their resources at the disposal of the Statutory Committee, and it is understood that arrangements are being made for the intensive education of suitable pensioners at these institutions.

When a man is transferred from a general hospital to a command dépôt it means that his disability is temporary, that he belongs to Group 1, and that he is considered likely to be fit for active service within six months. If, on

the other hand, he is transferred from a central hospital to an orthopaedic hospital he may belong either to Group 1 or Group 2. If to the former, his disability must be necessarily more severe than that of the man sent to a command depôt, and the treatment required to fit him again for active service may of necessity be prolonged. If, however, he belongs to the latter, Group 2—if, that is, the medical authorities of the central hospital decide that his disability is such as to prevent him from ever becoming fit for any form of military service owing to the fact that he suffers from such a lesion as, for example, severance of the right sciatic nerve with foot-drop, he may also be sent to an orthopaedic hospital. If there were always available beds at orthopaedic hospitals these patients could be automatically transferred there from the central hospitals without delay, but the length of time involved in the treatment of patients at orthopaedic hospitals of necessity greatly lessens the number of new patients that can be admitted in any one year. The length of stay of the individual is prolonged, and at present this is a very real difficulty; because of this lack of accommodation at orthopaedic hospitals men may have to be brought before invaliding boards and discharged from the service at central hospitals who still require to begin skilled orthopaedic treatment. The fact, however, that a man has been discharged from the army does not prevent him from attending an orthopaedic centre as an out-patient or from subsequently being admitted for further treatment to an orthopaedic hospital, but it is a break in the logical sequence of treatment. Among this class of case may be patients with injuries of the musculo-spiral, median, and ulnar nerves, and hemiplegias after head injuries.

FIG. 9.—Patients returning from France suffering from gunshot wounds of the knee rested in Thomas's "bed" knee splint.

This difficulty is being met by the establishment of more orthopaedic centres and special annexes, but the numbers of beds will have to be very large, for these cases are a numerous and growing class. At present the War Office allows any discharged soldier disabled by the war to obtain further treatment at a military hospital, if he requires it, and these men can always seek out-patient treatment at a military orthopaedic centre or hospital; but here again we are faced with the difficulty that they may not live within several miles' walking distance and cannot, therefore, obtain treatment. Recognizing our debt to these men and their future value to the State, it is essential that skilled orthopaedic treatment, based on a scientific knowledge of the principles of surgical rest and of the anatomical and biological methods by which recovery of muscular function can be obtained, together with the mechanical training necessarily accompanying these, should be made available for them. Disabled soldiers fall obviously into two classes: (1) Those who are wholly permanently disabled for any kind of work; (2) those who may by re-education be restored to social and professional efficiency in varying degrees. The recognition of what patients constitute class (1) can only be left to skilled orthopaedic surgeons and be based on the principles above enunciated. How to best treat those comprising class (2) is the present urgent question, but enough has been said to show that the problem, at least from its medical side, is being energetically and adequately grappled with.

I must especially thank Major C. V. Mackay, M.D., R.A.M.C., of the King George Military Hospital, for numerous valuable suggestions and for his assistance in drawing up the plan on which this information is based.

Orthopaedic Centres in the British Isles.

There are now fully established ten orthopaedic centres in Great Britain and Ireland.

In England there are already four, of which one is at Shepherd's Bush. The other orthopaedic centres in England are: Alder Hey, Liverpool, the first to be formed, under Colonel Robert Jones; Leeds, and Bristol. It is proposed to found additional centres at an early date. In Wales the orthopaedic centre is at Cardiff.

Two centres have been established in Ireland, one at Belfast, one at Blackrock, Dublin. In Scotland there are three: Bangour near Edinburgh, Aberdeen, and Bellahouston, Glasgow.

The same general scheme of treatment is adopted in each centre under the supervision of Colonel Robert Jones.

It may be mentioned that each orthopaedic centre deals, in addition to the repair of deformities, with the preparation of the stumps of limbless soldiers before admission to Roehampton and other hospitals where artificial limbs are provided.

List of Orthopaedic Hospitals and Centres in the United Kingdom.

Military Orthopaedic Hospital, Shepherd's Bush, W. 1,000 beds.
National Orthopaedic Hospital, Great Portland Street, W.C. 170 beds.
Military Orthopaedic Hospital, Alder Hey, Liverpool. 850 beds.
Welsh Metropolitan War Hospital, Whitchurch, Cardiff. 500 beds.
Beaufort War Hospital, Fishponds, Bristol. 500 beds.
2nd Northern General Hospital, Beckett's Park, Leeds. 250 beds.
Bellahouston Hospital, Glasgow. 400 beds.
Bangour Hospital, Edinburgh. 400 beds.
Oldmill Hospital, Aberdeen. 250 beds.
Belfast U.V.F. Hospital. 300 beds.
Dublin. 200 beds.

The Military Orthopaedic Hospital, Shepherd's Bush, London, may be described as typical of all the centres. It is fully equipped, and has a visiting and resident medical staff. It is under the personal supervision of the Inspector, who visits weekly. The number of patients admitted from the opening of the hospital on March 1st, 1916, to February 28th, 1917, was 2,870, and the number discharged 2,101.

The following list of the discharged patients is important as showing the beneficial results of treatment:

	1. Duty.	2. Command Depôt.	3. Re-classification.
1916.			
March	2	5	—
April	14	14	4
May	14	16	8
June	9	27	11
July	36	17	12
August	24	29	21
September	20	41	14
October	46	55	26
November	27	62	25
December	19	57	18
1917.			
January	34	27	16
February	17	32	26
	262	382	181

The majority of the patients under Class 3 (re-classification) were able to undertake mild forms of military duty, thus relieving fitter men for active service.

In reference to discharged patients it is important to bear in mind that owing to more rigid army regulations the discharge of men from the army to civil life as "unfit for further military service" has recently been considerably curtailed.

Apart from the question of available beds, there is no difficulty about the admission of a discharged soldier into this hospital for further treatment. On March 1st, 1917, the number of discharged soldiers in the hospital was 50, and there were 10 out-patients.

Electro-therapeutical Department.

This department is under the supervision of Captain Rowley Bristow, R.A.M.C., F.R.C.S. During the period July, 1916, to March 1st, 1917, the number of treatments given in the department was 19,000, and the number of new patients dealt with 728.

Type of Case.—The cases dealt with were mainly:

1. Peripheral nerve injuries.
2. Stiff joints with muscular wasting.
3. Atrophy of muscle.
4. Adherent and painful scars.
5. Functional conditions.
6. Trench feet and allied conditions.

Staff.—The staff consists of fourteen trained masseuses A.P.M.C. working under the direction of a surgeon in charge.

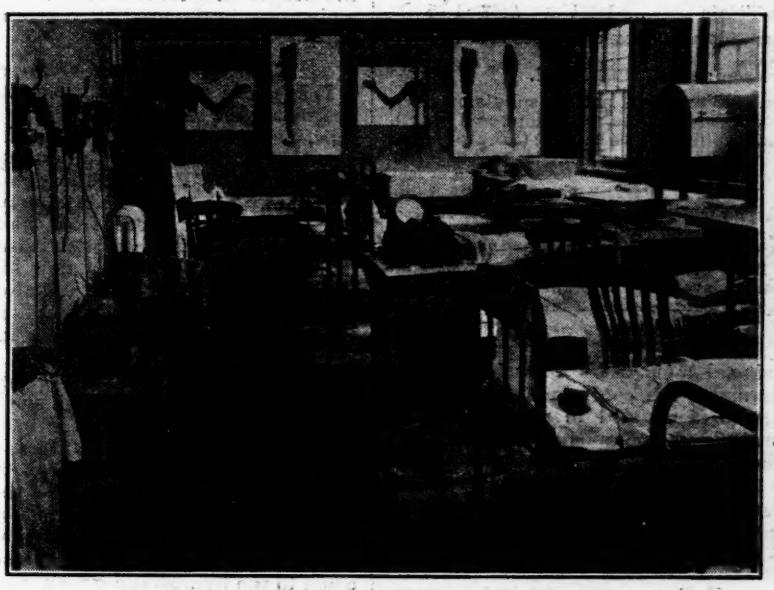

FIG. 10.—Interior of department for electro-therapeutics.

The electrical treatment of muscle is largely carried out by a specially wound faradic coil introduced by Captain Bristow. This coil is arranged so as to yield a current which is as nearly as possible painless, and which is under the control of the operator, so that the intensity of the stimulus can be altered from moment to moment. Rhythmical graduated contractions of muscle are brought about by this method. The muscle to be treated is made to contract gradually from zero to the desired maximum, and then allowed to relax. It is allowed to remain fully relaxed for a second, and then again stimulated. The left hand of the operator grasps the muscle and appreciates the degree of contraction, whilst the right controls the intensity of the stimulus. In this way the exact degree of contraction desirable for each muscle or muscle group is obtained. The control by hand is essential for the most efficient method of working, and no motor-driven or other form of mechanical interrupter can replace this control efficiently. With trained operators there is no risk of muscles being stimulated to the extent of causing fatigue, and so retarding progress. The main differences between this coil and the ordinary faradic coil are:

The special coil has thick wire in both the primary and secondary windings, and the number of layers in the secondary is less than in the primary—5 : 3. The interrupter can be exactly regulated by a sliding weight. A condenser of appropriate capacity is placed in circuit, to damp out the spark and assist in reducing the "skin effect" to a minimum.

The intensity of the stimulus is varied at will by (1) using either one, two, or three layers of the secondary; (2) by pushing in or withdrawing the soft iron core in the primary.

Massage.

The massage department is under the supervision of Dr. J. Mennell, and is equipped with all modern appliances for mechanical treatment. There are twenty-three trained assistants in the department — namely, twenty-one masseuses and two masseurs.

The number of patients treated and discharged from March, 1916, to March, 1917, was 863. On March 1st, 1917, the number of patients under treatment was 280. The average number of weekly treatments is 1,680.

Gymnasium and Hydrotherapy Department.

A large gymnasium is now in course of construction, to which patients will automatically pass from the massage department. The plans for a hydrotherapy department have been completed, and a building will shortly be placed under construction. Both these departments will be under medical control and in the immediate charge of trained instructors.

The Curative Workshops.

The curative workshops are of utmost importance. In these workshops the men are given a definite, regular, and interesting occupation, and energy instead of being wasted is directed to serve some useful purpose. These workshops, which are under the personal supervision of Mr. Poate, owe their existence to the energy and foresight of King Manuel, who has not only devoted his valuable time to those at Shepherd's Bush but has also superintended the erection of similar ones in other orthopaedic centres throughout the United Kingdom. The men working are employed as follows:

Employments in Curative Workshops.

Splint makers, smiths, engineers	25
Carpenters	10
Tailors (abdominal belts, surgical slings) ...	8
Bootmakers (surgical boots, repairs)	5
Fretworkers (men with dropped feet)	3
Leatherworkers (blocked leather splints) ...	4
Electricians, plumbers, and ironworkers ...	7
Masons (repairs in hospital)	2
Grindery (instruments used in operating theatres)	2
Wood choppers (sawing and chopping firewood for use of hospital)	9
Cigarette makers	7
Office and stores	4
Draughtsman	1
Orderlies and fatigue party (errands between different departments, keeping yard and shops clean, taking completed work to different wards)	11
Painters (painting splints and general work in hospital)	8
Total	106

In addition to this special work, over 300 have occupations allotted to them.

Return showing Number and Value of Splints Made in Orthopaedic Workshops.

Week ending—		£	s.	d.
October 28th, 1916	36	5	3	0
November 4th	49	7	14	6
,, 11th	75	17	3	9
,, 18th	64	9	11	6
,, 25th	86	12	9	0
December 2nd	21	11	2	6
,, 9th	23	13	16	0
,, 16th	67	14	18	0
,, 23rd	26	14	11	6
,, 30th	29	8	19	0
January 6th, 1917	43	12	8	0
,, 13th	70	20	12	0
,, 20th	55	19	1	0
,, 27th	133	34	0	0
February 3rd	122	27	9	0
,, 10th	91	30	0	0
,, 17th	55	19	17	6
,, 24th	81	17	16	6
March 3rd	106	31	4	6
,, 10th	139	34	4	2
Totals	1,371	£362	1	5

Total number of splints made from October 28th to March 10th, 1,371.
Cash value at pre-war prices, £362 1s. 5d.

Of the above returns 1,013 are stock pattern splints, namely, cock-up splints, gutters, club-foot shoes, crab (long and short), Turner's arm, whole hand-splints. The balance (358) are special splints designed in workshops, and made to surgeons' instructions.

Quantity of Orthopaedic Repairs by the Bootmaker.

The total number of cases requiring orthopaedic repairs by the bootmaker from October 21st, 1916, to March 4th, 1917, was 361. This was apart from ordinary repairs. The work consisted of inside and outside elevations, T-straps, cork soles, bars on soles, crooked heels, surgical boots and alterations according to medical orders.

Painting, Drawing, Photographic Department.

This department is under the control of Mr. Bird, the distinguished artist, who is assisted in photography by Mr. Lewis. Here not only photographs and drawings of cases during the various stages of treatment and splints used are made, but actual paintings in natural colour whenever the surgeon thinks it necessary. In this way can be kept complete records of operation cases, which are especially valuable in demonstration for teaching purposes.

X Rays.

This department is fully equipped with all the latest methods for *x*-ray photography under the supervision of Captain Keys-Wells, R.A.M.C., who attends the hospital daily.

Plaster Department.

This is under the charge of Sister Hurch, formerly of St. Bartholomew's Hospital, who has, as chief assistant, Private Wilde. Casts are made of all deformities admitted and permanent records can be kept of cases before and after operation. In addition to plaster jackets for support and plaster splints, casts are made of limbs and other parts on which splints, both leather and steel, are moulded so as to ensure accurate fitting when finished.

Artificial Limbs.

In association with the question of military orthopaedics it is important to remember that at Roehampton Hospital for Limbless Soldiers all cases of amputation are being provided with suitable artificial limbs at the expense of the State.

I am largely indebted for information relating to the Shepherd's Bush Hospital to the courtesy and assistance of Major Jenkins, R.A.M.C., Officer in Charge, Captain Hill, R.A.M.C., Registrar, and Mr. Poate, Director of Workshops.

The medical staff is to be congratulated in having converted within a week what was formerly an infirmary into a modern orthopaedic hospital.

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Observations ON THE PATHOLOGY OF CARDIAC DROPSY.

BEING THE OLIVER-SHARPEY LECTURES DELIVERED BEFORE THE ROYAL COLLEGE OF PHYSICIANS OF LONDON, MAY, 1917.

BY

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(Abridged.)

LECTURE II.

WE have now to consider the question of the abnormal exchange of fluid between the blood capillaries and the tissue spaces, which leads to an excess of tissue fluid in the congested area, to a deficiency in other parts, and to an increase in the total blood volume.

Absorption in Area of Superior Vena Cava.

It has been shown that when the inferior vena cava is obstructed the venous pressure in the fore part of the body falls, owing to abstraction of blood from this region, and also that at all stages of the disease this pressure is still below normal. The circulatory conditions in this part are, therefore, such as to determine a continuous absorption of fluid by the capillaries from the tissue spaces. It is not to be supposed that absorption is the only process occurring in this region, but that a new balance has been struck between lymph production and absorption. Exactly how this condition is brought about is not known, except that the low capillary pressure is a factor in the process of absorption.

Starling was the first observer to show that proteins are able to exert a definite though small osmotic pressure. In the case of the proteins of the blood plasma he found this pressure to be about 30 mm. Hg as compared with isotonic salt solution. The protein concentration of the extravascular fluid is a quarter or a third of that of the blood plasma, so that the latter is able to exert a definite osmotic attraction for the extravascular fluid. The force of this attraction, as I have already mentioned, is about equal to the hydrostatic pressure in the capillaries, so that when the latter falls below the normal level water will be absorbed.

Absorption in Area of Inferior Vena Cava.

Turning now to the consideration of the exchange of fluid in the area drained by the inferior vena cava our task is not so simple. I have so far assumed that increased absorption is occurring at the periphery as in the fore part of the body.

This question of absorption at the periphery can be examined experimentally, because the parietal peritoneum, which is included in this region, is particularly suitable for such experiments.

With regard to the visceral peritoneum, it is quite clear that output has overbalanced absorption, so that in order to find out what is happening in the case of the parietal peritoneum, we must inquire into the relative parts played by these two processes in the peritoneum generally during the various stages at which the fluid is accumulating, remaining stationary, or disappearing.

Output into Peritoneal Cavity.

Our inquiry into the subject must first be directed to the relative rates of output of fluid into the peritoneum at the different periods of the disease. I shall show later that absorption from the peritoneum is occurring always at the same rate, so that a comparison of the rates at which the ascites reaccumulates after the abdomen has been thoroughly emptied should give us the required information. For this purpose the animal was anaesthetized and the abdomen opened under aseptic precautions. The fluid was then removed with a graduated pipette and the abdomen closed. I found that, however large or small the amount of fluid removed, and whatever the stage of the disease, the ascitic fluid had reaccumulated on the next day.

It may be stated generally that the rate of output is rapid from the beginning, that it increases to some extent as the blood increases in volume, and that it diminishes gradually as the dropsy disappears, although the blood volume is still high. In all stages of the disease, therefore, the dropsy is being actively produced, and it is not a question of the production up to a certain point, and then the gradual absorption of the accumulated fluid after the production has ceased. Absorption is constantly occurring at a certain definite rate, and the accumulation and disappearance of the fluid are entirely due to alterations in the rate of output of lymph. As the anastomoses are established this rate of output falls, and the ascites, therefore, disappears. The ascites is not a stagnant pool of fluid, which is rapidly put out and then slowly absorbed, but at all stages of the disease there is a rapid and continuous circulation of lymph from the blood into the peritoneum and thence back into the blood. The ascitic fluid is thus being constantly changed.

Absorption from Peritoneal Cavity.

We now turn to the question of absorption from the peritoneal cavity, and at the outset it appears self-evident that this process must be occurring at the normal rate at least; otherwise, judging by the amount of fluid which is put out during the day, the animal would soon become tightly distended with ascitic fluid. If the mechanisms whereby absorption is carried out are normal, it is clear that a check would be placed to such a rapid accumulation of fluid, because in the normal animal it is well known that blood serum and other protein solutions are readily absorbed.

In order to test the rate of absorption of a *normal cat* for the ascitic fluid of another cat I did three experiments, and found that the normal cat absorbs at the rate of at least 2 c.cm. per hour, so that in twenty-four hours it would take up from 40 to 50 c.cm. A further point to note is that the amount of solid matter in the residual fluid was precisely the same as that in the ascitic fluid introduced. Absorption occurs at a uniform rate, and the fluid is absorbed as a whole.

The points which have now to be determined are whether the absorptive mechanisms of the *ascitic cat* are in a normal condition, and whether they are as capable of fulfilling their functions as are those of a normal animal.

The normal animal absorbs fluid from its peritoneal cavity in two ways:

1. By its subperitoneal lymphatic plexus and thoracic duct, and
2. By its subperitoneal blood capillaries.

We have, therefore, to inquire into the condition of the lymph flow from the thoracic duct of the ascitic animal, and whether the blood vessels of its peritoneum are capable of absorbing fluid at the same rate as those of the normal animal.

I. *Lymph Flow from the Thoracic Duct.*

The effect upon the lymph flow of *complete obstruction* of the inferior vena cava above the diaphragm is well known. Experimenting on the dog, Heidenhain showed that the lymph flow is immediately increased. This increase may be moderate but sometimes it is enormous—ten to twenty fold. The total solids in the lymph are increased by 1 or 2 per cent. Ligature of the portal vein gives rise to a more moderate increase in the lymph flow, the increase being about five fold. The total solids in the lymph in this case are diminished by about 1 per cent. Starling has proved that the lymph after obstruction of the inferior vena cava comes entirely from the liver, that its increased quantity is due to the very high pressure of blood in the liver capillaries, and that its increased concentration is due to the great permeability of the walls of the liver capillaries as compared with those in other parts of the body. I have repeated these experiments on the cat and have obtained similar results. I have not, however, found such great increases of lymph flow as occur in the case of the dog. The increases which I have noted after ligature of the inferior vena cava have been much smaller, not more than two or three times the normal, and commonly less than this. In all, however small the increase in quantity, the total solids of the lymph were increased by about 1 or 2 per cent.

When the vein is *partially obstructed* above the diaphragm, there is no immediate effect upon the lymph flow. The animals with ascites may be divided into two groups with respect to their lymph flow: The first group includes those during the first few days after the vein is constricted in which the venous pressures are normal or moderately raised, and in which the blood volume is normal or not materially increased; in this group the lymph flow is within normal limits. The second group includes all those at a later date in which the venous pressures are high, and in which the blood volume is increased; in this group the lymph flow is always increased. In both groups the rate of lymph flow does not depend upon the amount of ascites present.

Cause of Increased Lymph Flow.

We see, therefore, that when the disease is fully established there is a considerable increase in the lymph flow from the thoracic duct, and we have now to inquire whether this excessive flow is indicative of increased rate of absorption from the peritoneal cavity, or whether it is due to increased rate of lymph production.

If the increased flow of lymph were indicative of *increased rate of absorption* from the peritoneal cavity, the rate of flow should correspond with the amount of ascitic fluid present, because there is no other reason than the accumulation of peritoneal fluid which would give rise to the increased lymph flow. But I have shown that, although the thoracic duct is capable of carrying away fluid much more rapidly than normal, the lymph flow is not increased during the first few days when large amounts of ascitic fluid accumulate. Also, in the later stages the flow may be greatly exaggerated, although there are only small amounts of ascitic fluid present. It is quite true that the lymph flow increases at the period when there is an increase in the ascites, but that the two conditions depend upon some common factor and not the one upon the other is apparent from the comparative study of individual cases.

That injections of fluid into the peritoneum do not give rise to an increase in the lymph flow was shown first by Orlow, and later by other observers. Saline solutions are absorbed readily, but during the process there is no increase in the lymph flow. In the human being, however, the pressure of ascitic fluid not uncommonly reaches a considerable height. An abdominal pressure of 100 mm. Na_2SO_4 solution was recorded by Starling and myself in a case of ascites in a dog with heart failure. The abdomen contained 2,310 c.cm. of ascitic fluid and the lymph flow was greatly increased. During the first ten minutes 30 c.cm. of lymph (about ten times the normal) were obtained and when the flow settled down to a steady rate it remained about five or six times above the normal. After tapping the abdomen and emptying the cavity the lymph flow still remained at its high level, showing that the rapid flow was not due to draining away of the peritoneal fluid, but still it might have been due to drainage of distended lymph spaces. In order to determine whether fluid at high pressure was rapidly carried off by the thoracic duct from the peritoneal cavity I performed two experiments, which gave identical results, and showed that there was no increase in the lymph flow, although fairly large amounts of fluid were absorbed.

A distinction must be drawn between absorption by the lymphatics from the peritoneal cavity and from the tissue spaces. The peritoneal cavity is enclosed by a definite membrane, and is in intimate relation with a subperitoneal plexus of lymphatics, but there is probably no direct communication between them. It is regarded at the present time that the endothelial cells of the peritoneal membrane are everywhere in close contact with each other, and that there are no permanent openings between them. Fluids and solid particles, however, pass with ease through the interstices between the cells. The force causing the movement of such fluids and particles into the subperitoneal lymphatics from the abdominal cavity is derived from the movements of respiration, and more particularly of the diaphragm, owing to the arrangement of its lymphatics. Solid particles are no doubt chiefly carried through by leucocytes. The composition of the fluid on each side of the peritoneal membrane is practically the same, so that there is no force tending to osmosis or diffusion. Absorption from the peritoneum is thus a relatively slow process, and it is possible that if the respiratory movements are interfered with by an excessive accumulation of fluid the

process of absorption by the lymphatics will be correspondingly slow. The mere accumulation of fluid in the abdominal cavity would not, therefore, increase the outflow of fluid from it. A rapid output of lymph from the capillaries would, on the other hand, distend the lymph spaces, and materially raise the pressure in them, thus increasing the outflow of lymph. This is particularly true of the lymph spaces of an organ such as the liver, which is enclosed in a capsule, so that any increase of lymph production in it more easily raises the pressure in its lymph spaces, and increases the flow of lymph from its lymphatics. So long as the tissue fluid remains inside the abdominal organs it is absorbed comparatively quickly by the lymphatics, but when it drains out into the peritoneum it is lost to the lymphatics, and a certain time must elapse before it can be absorbed in the usual manner. The increased lymph flow of the ascitic animal is therefore not indicative of increased rate of absorption from the peritoneal cavity, but such absorption by the lymphatics takes place at the same rate at all stages of the disease, and also at the same rate as in the normal animal. There is no increase in the rapidity with which fluid is drained off during the period of subsidence of the ascites from the peritoneum or from the lymph spaces, which might be supposed to have been overfilled.

If the increased lymph flow of the ascitic animal is not dependent upon increased rate of absorption of the ascitic fluid, it must be an index of *increased lymph production.*

We have already seen that, at the period at which the lymph flow becomes increased, the ascites attains its maximum height both in quantity and rate of production. The latter depends upon the rate of production of lymph, so that the increased lymph flow coincides with increased lymph production. At this time, also, a general plethora is established, the pressures in the portal vein and inferior vena cava rise and the liver swells to an increased extent. It was first shown by W. Müller, and is now universally recognized, that in artificial plethora there is increased lymph production and increased lymph flow from the thoracic duct. This increased lymph production takes place chiefly in the abdominal organs, which are thus responsible for the increase in the flow of lymph. There is therefore no doubt that the increased lymph flow and the increase in the ascites are directly dependent upon the plethora, and that the lymph comes from the abdominal organs, particularly the liver.

The question which now requires an answer is why there is no increase in the lymph flow from the liver in incomplete obstruction of the inferior vena cava until the condition of plethora is established, whilst there is a considerable output of fluid into the peritoneum, giving rise to ascites. The explanation appears to lie in the different degrees of tension in the distended liver. The flow of lymph is constant from the lymphatic radicles to the thoracic duct and thence into the veins. There must, therefore, be a gradual rise of pressure as we follow the lymph stream up into the liver. The higher the pressure in the lymphatics of the liver the more rapid must be the flow of lymph. In the early stages of narrowing of the inferior vena cava the liver distends owing to the rise of venous pressure behind the obstruction, but we have seen that this rise, although enough to dilate the vessels of the liver and fill out that organ with blood, is really only trifling. The vessel walls are altered and lose their tone, so as to remain dilated under a pressure which is normal or only slightly raised. The lymph production is increased owing to nutritive changes in the capillary walls, but the pressure in the lymphatics does not rise high enough to materially increase the lymph flow from the thoracic duct. The nutrition of all the tissues of the liver suffer, and lymph drains out through the capsule into the peritoneum. When plethora is established the venous pressures rise to a high level, the liver enclosed in its capsule distends further, and the tension within it becomes considerable. There is a further increase in the lymph production, and the lymph finds an easier exit through the lymphatics than through the capsule. The condition now has become somewhat similar in many features to that immediately resulting from complete obstruction of the inferior vena cava, in which there occurs a rapid rise of pressure in the liver, a great increase in the lymph flow, and slight ascites. Ascites will accumulate without any material rise of pressure in the liver, but the rate of the lymph flow is directly dependent on the pressure in that organ. In the case of complete obstruction the percentage of total solids in the lymph is increased, this being due to the fact that the lymph is entirely derived from the liver. In the ascitic animal there is no increase in the solids of the lymph although the flow is increased. This is what might be expected if the increased lymph flow resulted from plethora, because in this condition the lymph comes not only from the liver but also from the intestine, the lymph of which is of less protein concentration than normal lymph. The lymph is of no greater concentration than the normal because it is a mixture of intestinal and liver lymph. Before plethora is established, and when the lymph flow is normal, the percentage of total solids is also within the normal limits.

II. *Absorption by the Subperitoneal Blood Capillaries.*

For reasons which I have already stated, I assumed that increased absorption was taking place by the capillaries at the periphery of the body, and we have now to inquire whether this assumption is justified by experiment. The blood from the capillaries of the parietal peritoneum passes into the veins of the abdominal wall, so that these capillaries form part of the system of vessels which are situated at the periphery. If, therefore, it can be proved that an increased absorption is taking place from the peritoneum directly into the blood, we shall be justified in concluding that our assumption is correct, because it is obvious that the visceral peritoneum, which is putting out lymph at such a rapid rate, cannot be held responsible for increased absorption.

For many years it had been known to physiologists that the blood vessels were able to absorb fluids and dissolved substances, but due prominence was not given to this method of absorption until it was definitely proved by Starling and Tubby that absorption of colouring matters in solution from the serous cavities took place rapidly by the blood vessels. They found that the residue of the solution, which they had introduced into the serous cavity, on withdrawal contained protein, and concluded that the process at work was really one of interchange between the fluid in the cavity and the blood, each taking from the other that constituent which it did not possess.

Later researches by Leathes and Starling showed that this absorption was due to osmosis, and that there was no question of any active absorption by the endothelium because there was no material difference in the process when the endothelium was injured by sodium fluoride or by scalding. They proved that not only was water absorbed by osmosis, but also sodium chloride by diffusion.

Osmosis and diffusion will thus account for the absorption of saline solutions by the blood vessels up to a certain point—namely, that at which there is equalization of the amounts of the various salts on each side of the membrane when osmotic equilibrium is established. The osmotic pressure of the blood proteins, as Starling has pointed out, must also be taken into account, the force of attraction of which for extravascular fluid varies inversely as the concentration in protein of the latter. One would therefore expect absorption of fluid by the blood vessels to still continue until increasing protein concentration of the peritoneal saline solution reduced the absorbing force due to the difference of osmotic pressures on each side of the membrane to the level of the hydrostatic pressure in the capillaries. Further than this osmosis and diffusion will not account for the absorption of ascitic fluid by the capillaries.

Normal Cat.

Our first task is, therefore, to find out whether the ascitic animal is capable of absorbing salt solution by its subperitoneal blood capillaries, and, if so, what is the rate of this absorption as compared with the normal. In order to do this I have employed Starling's method of injecting a coloured solution into the peritoneum, and first, in order to obtain a standard of the normal rate of absorption in the cat, I repeated the experiments on the normal animal. As the urine is not uncommonly suppressed in these experiments, instead of noting the colour of this fluid as an index of the colour of the blood, small amounts of blood were withdrawn from the femoral artery at short intervals.

Three experiments were done, with the same results in each case. The blood serum was distinctly tinged blue in about six minutes after introducing the fluid into the peritoneum, and in a few minutes later it was fairly dark blue

The lymph was tinged in from fifteen to twenty minutes, and was fairly dark blue in thirty to forty minutes. The urine was also coloured blue when it was excreted. In no case was the lymph flow increased, and it was never darker than the corresponding sample of blood.

These experiments are in entire agreement with those of Starling, and show that coloured saline solution is absorbed rapidly from the peritoneum of the cat by the blood vessels, being distinctly visible in the blood in about six minutes, and in the lymph in about fifteen to twenty minutes.

Ascitic Cat.

We now turn to a consideration of absorption by the blood vessels of the ascitic animal. I have done two experiments: the first animal had had its inferior vena cava narrowed twenty-four hours, and the second one twenty-seven days, previously. The experiments were conducted exactly as described above. In the case of the first cat the lymph flow, as is usual with animals on the day after operation, was normal. In four minutes after the indigo solution had been introduced the blood showed a distinct tint of blue which rapidly darkened, but the lymph was not stained until about sixteen minutes had elapsed after the first tint appeared in the blood. The second cat, which had been operated upon twenty-seven days previously, was well nourished and healthy. The lymph flow of this cat was increased, as is usual with animals at the end of a month when the blood volume is increased. The blood was tinged blue in four minutes, and the lymph in ten minutes, after the coloured fluid was introduced. The colours of the blood and lymph increased in intensity, the blood at first being the darker of the two.

It is quite evident from these two experiments that the ascitic animal is quite as capable of absorbing coloured saline solution by its subperitoneal capillaries as the normal animal, and that the absorption occurs more rapidly, because the blood was tinged in a shorter time in the ascitic than in the normal animal. The rate of osmosis is therefore greater than in the normal animal, and from this we are justified in drawing the conclusion that the capillaries of the abdominal wall are absorbing fluid from the tissue spaces more rapidly than normal. The same conclusion must be formed in regard to the hind limbs, so that in the whole periphery of the body increased absorption is taking place.

One further fact is noticeable. The lymph of the second animal was coloured in about half the normal time. This is due to the more rapid lymph flow of the animal. It is an additional fact in support of my statement earlier on that the increased lymph flow of the ascitic cat is an index of increased lymph production.

It will be remembered that a portion of the parietal peritoneum is drained by veins opening into the superior vena cava. It might, therefore, be objected to these experiments that the osmotic absorption of fluid really occurred into these vessels and not into those opening into the inferior vena cava, so that the experiments did not prove absorption by branches of that vessel. This question can easily be set at rest by ligaturing the superior vena cava before the coloured fluid is run into the peritoneal cavity, so that there can be no doubt that the fluid is absorbed by branches of the inferior vena cava. I therefore performed two experiments of this nature. In the first cat the inferior vena cava had been constricted three days. A cannula was connected with the thoracic duct, and the superior vena cava ligatured between the entrance of the azygos vein and the auricle. The lymph flow was normal. In two minutes the blood serum was tinged blue and in four minutes from the beginning its colour was markedly blue. The lymph was not tinged till twenty-one minutes after the fluid was introduced. The second cat was also a three days cat. The same procedure was adopted. The lymph flow of this animal was a little above the average. In two minutes the blood serum was tinged blue as in the first cat. The lymph was tinged in ten minutes.

These two experiments prove that the osmotic absorption of fluid occurs into the blood vessels of the parietal peritoneum when all anastomoses are cut off. It will be noticed that absorption occurs in a third of the normal time when the superior vena cava is ligatured. I have already shown that when this vein is ligatured there is a great rise of pressure in all its tributaries from the accumulation of blood in them, and that simultaneously the pressure in all the tributaries of the inferior vena cava falls owing to abstraction of blood. This is the reason of the increased rate of absorption of the fluid. Ligature of the superior cava relieves the abdominal vessels of some of their blood, with the result that they take in fluid more rapidly. It is thus clear that, when both superior and inferior venae cavae are obstructed together, increased absorption takes place in the extremities and in the body wall, whilst increased output is occurring in the central parts of the body. This must also take place in uncompensated heart disease, which I have shown to be precisely similar in its results to the simultaneous obstruction of the superior and inferior venae cavae.

So far we have considered the rate of absorption by osmosis at an early stage of the process, and we have now to study the rate at which it occurs *during the later stages* until absorption is complete. This was investigated by removing all the ascitic fluid and replacing it by normal saline solution, which was withdrawn at different periods of time, and examined in regard to its amount and its concentration in dissolved solids as compared with the normal animal.

On comparing the rates of absorption of saline solution in the normal and the ascitic cat I have found that during the first hour almost the same amounts are absorbed, the ascitic cat absorbing rather more than the normal, but the residual fluid in the ascitic cat contained a percentage gain of solid matter which was six times as great as that of the normal cat. In the next experiment the absorption was allowed to go on for eight hours: 70 c.cm. of saline solution were introduced into a normal cat and at the end of eight hours only 3 c.cm. could be recovered from the peritoneum; the percentage of total solids in it amounted to 4.7; 45 c.cm. of ascitic fluid were removed from the peritoneal cavity of a dropsical cat and 70 c.cm. of saline solution introduced; at the end of eight hours 45 c.cm. were recovered from the peritoneum. The rate of absorption in this cat had fallen off two and a half times as quickly as in the normal animal. The percentage of total solids in the residual fluid was 6.6. The original ascitic fluid of the cat contained 7.9 per cent. of total solids, so that in eight hours the animal had almost made up its original percentage of solid matter in the peritoneal fluid, and the volume of the fluid was precisely the same as the original amount of ascitic fluid. In another ascitic cat of two weeks' standing 30 c.cm. of fluid were removed containing 6.5 per cent. total solids. The amount of saline solution introduced was 49 c.cm., and after twenty-four hours 22 c.cm. of fluid were removed containing 6.5 per cent. solids.

One may state generally that certainly within twelve hours the introduced fluid will have become about the same as that originally withdrawn both in amount and composition. We see, therefore, that in the ascitic cat the interchange of solids between the blood and the saline solution contained in the peritoneum is a much more rapid process than in the normal animal. The process of osmosis is more rapid in the ascitic than in the normal animal during the early stages, but it is interrupted much more quickly in the ascitic animal by the more rapid output of solid matter, so that in the later stages absorption of fluid becomes much slower, and osmotic equilibrium is established long before the fluid can possibly be absorbed.

We have now to inquire into the *origin of the protein* which accumulates in the peritoneal fluid. The presence of salts which collect in the fluid are quite easily accounted for by diffusion, so that the partial pressure of each saline constituent of the blood becomes equal on each side of the separating membrane. The presence of the protein cannot be thus easily explained, as protein is indiffusible. In the first place, I must point out that we are dealing with two sets of blood vessels—those of the viscera, in which output has overbalanced absorption, and from which the ascitic fluid originates, and those of the parietal peritoneum which are absorbing more quickly than normal—so that we must distinguish two separate processes: osmotic absorption of fluid and equalization of partial pressure of salts by diffusion in the case of the capillaries of the parietal peritoneum, and increased output of lymph from those of the viscera. It is the increased output of lymph into the saline solution which rapidly brings its concentration in protein and salts up to that of the original ascitic

fluid, and so arrests osmosis and diffusion in the case of the parietal peritoneal vessels. This arrest of osmosis occurs at a certain stage in each animal, depending entirely upon the rate of output of lymph.

The protein thus originates in the lymph which is being rapidly produced by the viscera, and for this reason the fluid becomes of the same composition as the original ascites.

When salt solution is introduced into the peritoneum of the normal animal protein appears in it for the same reason—namely, that there is normally a very slow output of lymph into the peritoneum, which is being as rapidly absorbed, so that this structure is kept slightly moist, and there is no accumulation of fluid in it. It is this normal lymph production which accounts for the appearance of protein in the peritoneal saline solution. In support of this hypothesis may be mentioned the fact, noted by Gray and myself, that sometimes in the normal hutch-fed rabbit, and commonly when it is pregnant and the muscles are flabby and the abdomen is full, ascitic fluid is present. We showed that there were no pressure changes in the circulation of these ascitic animals. The ascitic fluid of these rabbits appears to be normal tissue fluid, the rate of production of which is probably normal, but absorption by the lymphatics is impeded owing to the respiratory movements and action of the abdominal muscles being less effective in this direction than are those of a wild animal, in which the abdomen is taut and the movements active and vigorous.

Finally, we arrive at the question whether absorption entirely ceases by the blood vessels of the peritoneum when osmotic equilibrium is established between the ascitic fluid and the blood. This entirely depends upon whether protein is absorbed by the capillary wall or not.

An increased absorption of fluid may be occurring by the capillaries of the abdominal wall, although they do not take up the ascitic fluid from the peritoneum. The explanation of this is that the protein concentration of tissue fluid is kept low by the tissue cells using up the protein during their metabolic activities, whilst the ascitic fluid remains of the same protein concentration. Until proof is forthcoming that absorption of protein may occur by the capillary wall, we must assume that when the ascitic fluid attains osmotic equilibrium with the blood plasma the ascites is entirely absorbed by the lymphatics.

Summary.

1. The accumulation of fluid in the peritoneal cavity following an incomplete obstruction of the inferior vena cava in the chest, or in uncompensated heart disease, is due to an increased output of lymph from the viscera, more especially the liver. This increased output is constantly occurring at all stages of the disease; an increase in the amount of fluid is due to an increase in the rate of output, and the disappearance of the fluid is due to a gradual falling off of the rate of output.

2. Absorption from the peritoneal cavity by the lymphatics is occurring at all stages at the normal rate, a check being thus placed to an excessive accumulation of the ascitic fluid. The fluid is therefore being continuously renewed, and there is a constant circulation of lymph from the blood into the peritoneal cavity and back again to the blood by the thoracic duct.

3. Increased absorption of tissue fluid is taking place in the abdominal wall and hind legs, as in the fore part of the body, but it has not been proved that the ascitic fluid is absorbed as such by the capillaries of the parietal peritoneum. There is no evidence to show that the endothelial cells of the peritoneum actively absorb the fluid.

4. The increased lymph flow from the thoracic duct observed at a certain stage in the course of the dropsy is an index of increased lymph production in the abdominal organs owing to the plethora.

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THE DISINFECTION OF DRINKING WATER

With a Description of a New Substance for the Preparation of Stable Tablets for the Sterilization of Polluted Water.

BY

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(Report to the Medical Research Committee.)

The sterilization of contaminated drinking water is a problem of special importance in war time. The use of bleaching powder, or similar hypochlorite or chlorine preparation, has been used with the greatest success for the sterilization of relatively large volumes of water. The use of water-carts containing water treated with a carefully regulated quantity of bleaching powder has given every satisfaction when the method could be satisfactorily carried out—as, for example, when troops are practically stationary. The problem of sterilizing small individual quantities of water, such as are needed by cavalry or rapidly moving troops, is much more difficult, and, up to the present, it has not been perfectly solved. The use of hypochlorites for such purposes is difficult, owing to the instability of small tablets containing the minute quantity of active disinfectant. In their place acid sulphates of the alkali metals have been extensively used in tablet form, but the superior potency of many chlorine compounds would indicate that a stable potable chlorine disinfectant suitable for the sterilization of small quantities of water is desirable. With this end in view, we have made a number of experiments with various types of substances, one of which we believe to be worth practical application.

Our first experiments were made with chloramine-T,* but it was found that when this substance was added to heavily contaminated waters it required a relatively high concentration to sterilize the water promptly, particularly in the case of hard alkaline waters. For example, 1 part of chloramine-T to 25,000 parts of water may be necessary, and such an amount is decidedly unpalatable. Subsequently it was found that much lower concentrations of chloramine-T were effective if the contaminated water was slightly acidified with any acid—for example, citric, tartaric, acetic, etc. Under these conditions 1 : 250,000 or less of chloramine-T was effective (see Table I), and the resulting water was not unpleasant to the taste. But

TABLE I.

Experiments with Chloramine-T, with and without Addition of Tartaric or Citric Acid.

No.	Water Treated.	Concentration of Disinfectant.	Acid Added. Grams per Litre.	Time of Action in Minutes.	Surviving Organisms per c.cm.
1	Hard water + B. coli ...	—	—	—	2,508,800
		1 : 25,000	None	10	35,200
		1 : 25,000	None	30	14,880
2	Hard water + B. coli ...	—	—	—	1,120,000
		1 : 300,000	0.4	10	180
		1 : 300,000	0.4	30	0
3	Hard water + B. coli + 0.1 % faeces	—	0.8	—	3,232,000
		1 : 200,000	0 8	10	0
4	Hard water + B. coli ...	—	0.2	—	520,000
		1 : 250,000	0.2	10	27,200
		1 : 250,000	0.2	30	7,200
		1 : 250,000	0.8	10	130
		1 : 250,000	0.8	30	50
5	Hard water + V.cholerae	—	—	—	744,000
		1 : 250,000	0.8	10	0
		1 : 500,000	0.8	10	0
6	Hard water + B. typhosus	—	—	—	345,000
		1 : 250,000	0.8	10	0
		1 : 500,000	0.8	10	1,760
		1 : 500,000	0.8	30	0

* The abbreviated name for sodium toluene-*p*-sulphochloramide. (Cp. British Medical Journal, January 29th, 1916; *Proc. Roy. Soc.*, B, 89, p. 232, 1916.

chloramine-T could not be made up in a tablet with the addition of an acid without decomposition, and the two tablet system was regarded as impracticable.

Subsequently we experimented with preformed toluenesulphondichloramines, since a substance of this type is formed on adding acid to chloramine-T. The early results were most encouraging (see Table II), and it was

TABLE II.

Experiments with o- and p-Toluenesulphondichloramine in Powder and Tablet Form.

No.	Water Treated.	Concentration of Disinfectant.	Time of Action in Minutes.	Surviving Organisms per c.cm.	Form of Disinfectant.
1	Tap water + B. coli...	—	—	11,520	
		1 : 250,000	7	680	*o*-powder
		1 : 250,000	15	0	
2	Tap water + B. coli...	—	—	40,980	
		1 : 250,000	7	20	*o*-powder
		1 : 250,000	15	4	*o*-powder
		1 : 250,000	30	0	*o*-powder
3	Hard water + faeces suspension	—	—	22,080	
		1 : 250,000	7	200	*o*-powder
		1 : 250,000	15	0	*o*-powder
4	Hard water + 10% city sewage	—	—	64,000	
		1 : 250,000	7	448	
			15	210	
			30	74	
			60	2	
5	Tap water + 2.5% city sewage	—	—	6,420	
		1 : 250,000	7	0	*o*-powder
6	Tap water + 5% sewage	—	—	18,300	
		1 : 250,000	7	1,644	*p*-powder
		1 : 250,000	15	455	
		1 : 250,000	30	0	
7	Tap water + 5% sewage	—	—	18,300	
		1 : 500,000	7	11,928	*p*-powder
			15	2,600	
			30	930	
			60	0	
8	Tap water + 5% sewage	—	—	18,300	
		1 : 1,000,000	7	19,405	*p*-powder
		1 : 1,000,000	15	18,920	
		1 : 1,000,000	30	7,024	
		1 : 1,000,000	60	630	
9	Hard water + B. coli	—	—	161,000	
		1 : 200,000	10	166,400	*p*-tablet
		1 : 200,000	40	108,288	
		1 : 200,000	60	56,160	

not until we had the product put up in tablet form that we found it to be unsuitable. The difficulties were twofold. When the small necessary quantity of dichloramine —for example, 0.002 gram for 0.5 litre of water—was mixed with what were assumed to be inert salts, such as, for example, sodium chloride, for making into small tablets, the very slow normal rate of decomposition of the dichloramine was greatly accelerated. Secondly, the dichloramine, in tablet form, became too insoluble to effect prompt sterilization. The substance had therefore to be abandoned, and we turned our attention to a search for similarly active compounds which would show greater stability and solubility.

The substance which is the most suitable that we have yet found is *p*-sulphondichloraminobenzoic acid—$Cl_2N.O_2S.C_6H_4.COOH$. It is easily prepared from cheap, readily available materials, and appears to be effective and reasonably stable. The presence of the COOH group confers a slight but definite degree of solubility in water, which is increased by dispensing it with alkaline salts such as sodium carbonate or bicarbonate, borax or sodium phosphate. Formulae for the tablets are appended, together with details of the preparation of the substance and an estimate of its cost. Since the synthetic name of the disinfectant is inconveniently long for ordinary use, we propose to apply the name "halazone" to the tablets containing it. The abbreviated name gives some indication of the character of the compound.

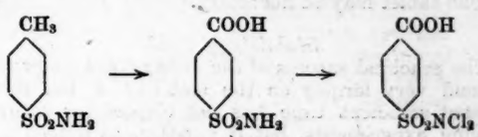
In Table III (p. 684) are given some of our bacteriological results. The technique employed was that in general use and requires no special description. Five or ten standard drops of the treated water were generally used for plating on agar for counting the surviving organisms. Suitable controls were invariably carried out.

From the results in Table III it appears that a concentration of 1 : 300,000 is sufficient to sterilize an ordinarily heavily contaminated water in about thirty minutes. Such a concentration could be relied upon to remove *coli*, typhoid, or cholera organisms. Special experiments showed that the substance in tablet form was efficacious when acting on water contained in aluminium bottles, although a very trifling action on the metal may be observed if tablets are allowed to remain undisturbed in long contact with the metal. We believe such action to be of no practical moment. The concentration of disinfectant given above is just perceptible to the taste, especially in warm water containing little organic matter, but the water is perfectly palatable. One point of advantage possessed by the present disinfectant over most hypochlorite preparations is the fact that the active chlorine is less rapidly used up, so that the process of disinfection continues for a longer period.

Preparation and Properties of the Disinfectant.

The starting-point in the preparation of the substance is *p*-toluenesulphonamide, a product which is readily obtained by the action of ammonia on *p*-toluenesulphonic chloride. The latter substance is a very cheap waste product in the manufacture of saccharine, and is available in relatively large quantities. It is now used for the manufacture of chloramine-T.

Toluenesulphonamide is oxidized to *p*-sulphonamidobenzoic acid, and the latter substance on treatment with chlorine under suitable conditions gives the desired dichloramino acid. The reactions may be expressed as follows:



The experimental details are as follows:

Preparation of p-Sulphonamidobenzoic Acid.

Add 250 grams commercial sodium dichromate to a mixture of 200 c.cm. concentrated sulphuric acid and 600 c.cm. water contained in 2-litre round flask. Then add 100 grams crude toluene-*p*-sulphonamide, and heat on a sand bath with reflux condenser for one hour, using a small flame at first as the reaction is vigorous. On cooling, wash the separated crystals well with cold water, and then dissolve them in hot dilute sodium hydroxide in slight excess. Filter hot, and add excess of hydrochloric acid, and when cold filter off the precipitated acid and wash well with water and dry. The yield is about 80 per cent. of theory.[1]

Preparation of p-Sulphondichloraminobenzoic Acid.

Twenty grams of *p*-sulphonamidobenzoic acid are dissolved in 200 c.cm. approximately normal sodium hydroxide (2 mols.), warming if necessary. About 200 grams of crushed ice is then added, and the mixture saturated with a rapid current of chlorine. The reaction is most conveniently carried out in a fairly wide-mouthed flask, which may be shaken while the gas is being introduced. If the temperature should rise more ice can be added. A white, rather chalky precipitate of the dichloramino acid is at once precipitated. The acid is filtered off, using suction, well washed with cold water, and dried *in vacuo* on a porous plate. The dry substance is practically pure, and may be powdered and preserved apparently indefinitely. Prepared by this method, the yield of the dichloramino acid is practically the theoretical amount.

The substance is sparingly soluble in water and in chloroform and insoluble in petroleum. It readily dissolves in glacial acetic acid, crystallizing in stout prisms, which melt at 213° C. The substance explodes feebly when rapidly heated on platinum foil, but, compared with most members of the group, is remarkably stable.

The purity of the compound may be checked by titration as follows: 0.1 gram is weighed out, dissolved in glacial acetic acid and potassium iodide added. The liberated iodine is titrated with decinormal sodium thiosulphate, of which 14.8 to 14.9 c.cm. will be required.

The dichloramino acid dissolves, apparently without change, in excess of cold sodium hydrate solution, and may be reprecipitated on addition of acids. With smaller quantities of sodium hydroxide or with feebly alkaline

salts, such as phosphates or borates, hydrolysis occurs, with liberation of disagreeably smelling compounds of nitrogen and chlorine.* (See footnote at end.)

Preparation of Tablets.

We have observed no very marked differences in the behaviour of the sulphondichloraminobenzoic acid when made into a tablet with salt and either sodium carbonate or bicarbonate, dry or crystallized borax, or sodium phosphate, although the crystallized salts are undesirable if the tables are exposed to high temperatures. The sodium carbonate tablets seem as satisfactory as any, and a convenient formula for tablets weighing 100 to 105 mg. is to use sulphondichloraminobenzoic acid 4 per cent., sodium carbonate 4 per cent. (or dried borax 8 per cent.), sodium chloride (pure) 92 per cent. The acid should be ground up with the dry salt and the sodium carbonate added subsequently. The mixture may be passed through a 40-mesh sieve. No lubricant or other addition is necessary and should be avoided. The strength of the tablets should be tested by dissolving in acetic acid and potassium iodide solution, and titrating with sodium thiosulphate as already described (1 c.cm. of N/10 thiosulphate = 0.00675 gram of the dichloramino acid). They must not be allowed to dissolve in water and subsequently titrated, as then decomposition occurs. The tablets should be stored in small amber glass bottles.

Tablets so prepared of the weight mentioned contain about 4 mg. of the disinfectant, and are suitable for the sterilization of a litre or quart of reasonably heavily contaminated water. In the case of extreme contamination a second tablet may be necessary.

Stability of Tablets.

The practical success of the disinfectant we propose will depend very largely on the stability of the tablet. At present sufficient time has not elapsed for entirely convincing experiments, but it appears, as judged by a very few months' observation, that the tablets are stable enough for practical use. They are certainly more stable than other similar compounds with which we are acquainted. When kept in amber bottles under ordinary conditions no decomposition was noted in two months. When exposed to bright sunlight in clear glass tubes decomposition was more marked, and the same was true of the crystallized borax tablets at a temperature of 38° C. The dried borax and sodium carbonate preparations were stable under these conditions, the bicarbonate ones less so. On the whole, dry borax or dry sodium carbonate appear preferable to the other salts.

TABLE III.

Experiments with p-Sulphondichloraminobenzoic Acid in Tablet Form.

BACILLUS COLI.

No.	Water Treated.	Concentration of Disinfectant.	Time of Action in Minutes.	Surviving Organisms per c.cm.	Tablet Dissolved, in Minutes.
1	Tap water + B. coli ...	—	—	63,800	
		1 : 200,000	30	0	4
2	Tap water + B. coli ...	—	—	38,629	
		1 : 200,000	30	0	9
3	Tap water + B. coli ...	—	—	112,525	—
		1 : 200,000	15	0	9
4	Tap water + B. coli ...	—	—	112,525	
		1 : 250,000	15	0	9
5	Tap water + B. coli ...	—	—	112,525	
		1 : 400,000	15	0	10
6	Tap water + B. coli ...	—	—	178,528	
		1 : 500,000	15	987	10
		1 : 500,000	30	0	10
7	Tap water + B. coli ...	—	—	125,420	
		1 : 500,000	15	406	12
		1 : 500,000	30	0	12
8	Tap water + 5% sewage + B. coli	—	—	1,119,000	
		1 : 175,000	15	6,000	9
			30	0	9
			60	0	9
9	Tap water + 5% sewage + B. coli	—	—	1,158,500	
		1 : 330,000	15	120,064	7
		1 : 330,000	30	9,146	7
		1 : 330,000	60	0	7
10	Tap water + 5% sewage + B. coli	—	—	1,120,000	
		1 : 500,000	15	284,800	5
		1 : 500,000	30	49,318	5
		1 : 500,000	60	70	5
11	Deep yellow polluted river water + B. coli	0	—	33,152	
		1 : 250,000	20	10,940	13
		1 : 250,000	40	852	
		1 : 250,000	60	0	

TABLE III (*continued*).

PATHOGENIC ORGANISMS.

No.	Water Treated.	Concentration of Disinfectant.	Time of Action in Minutes.	Surviving Organisms per c.cm.	Tablet Dissolved, in Minutes.
12	Tap water + B. typhosus	0	—	1,155,400	
		1 : 225,000	20	0	17
13	Hard water + B. typhosus	0	—	85,400	—
		1 : 333,333	20	0	14
14	Tap water + 5% sewage + B. typhosus	0	—	66,017	
		1 : 333,333	20	242	14
		1 : 333,333	40	0	
15	Tap water + 5% sewage + B. typhosus	0	—	240,000	—
		1 : 225,000	20	13	14
		1 : 225,000	40	0	
16	Tap water + B. paratyphosus A	0	—	112,000	
		1 : 225,000	20	0	17
17	Tap water + 5% sewage + B. paratyphosus A	0	—	138,880	—
		1 : 225,000	20	0	13
18	Tap water + 5% sewage + B. paratyphosus A	0	—	29,400	—
		1 : 333,333	20	15	12
		1 : 333,333	40	0	
19	Tap water + B. paratyphosus B	0	—	322,500	
		1 : 225,000	20	10	17
		1 : 225,000	40	0	
20	Tap water + 5% sewage + B. paratyphosus B	0	—	309,120	
		1 : 225,000	20	305	13½
		1 : 225,000	40	0	
21	Tap water + 5% sewage + B. paratyphosus B	0	—	139,776	
		1 : 333,333	20	290	12
		1 : 333,333	40	0	
22	Tap water + V. cholerae	0	—	13,706	
		1 : 450,000	20	0	13½
23	Tap water + 5% sewage + V. cholerae	0	—	11,170	13
		1 : 333,333	20	0	
24	Tap water + B. dysenteriae (Flexner)	0	—	66,998	
		1 : 450,000	15	25	13
		1 : 450,000	30	0	
25	Tap water + B. dysenteriae (Flexner)	0	—	98,990	
		1 : 333,333	20	17,363	7
		1 : 333,333	40	58	
26	Tap water + 5% sewage + B. dysenteriae (Flexner)	0	—	164,864	
		1 : 333,333	20	38	13
		1 : 333,333	40	0	
27	Tap water + B. dysenteriae (Shiga)	0	—	33,852	
		1 : 450,000	15	12,227	6
		1 : 450,000	30	1,060	
28	Tap water + B. dysenteriae (Shiga)	0	—	31,200	
		1 : 333,333	20	10,934	11
		1 : 333,333	40	0	
29	Tap water + 5% sewage + B. dysenteriae (Shiga)	0	—	2,108	
		1 : 333,333	20	0	13

Tap water = New York City water (Croton Reservoir).

Cost.

It is rather difficult to give precise estimates of the cost of the finished product, but it is safe to say that the tablets could be sold at such a price that 100 gallons of water could be sterilized at a cost of one penny.

REFERENCE.

[1] Cf. Remsen, *Ann.*, 178, p. 298, 1875.

* If the ethyl ester of sulphonamidobenzoic acid is chlorinated in chloroform solution in the presence of aqueous sodium acetate, ethyl sulphondichloraminobenzoate is readily obtained on evaporating the chloroform solution. It crystallizes from acetic acid or carbon tetrachloride in stout prisms, which melt at about 80° C. One tenth of a gram on titration with thiosulphate, after adding potassium iodide, required 14.0 c.cm. The theoretical amount for $Cl_2N.SO_2.C_6H_4.COOC_2H_5$ is 14.1 c.cm. The substance was not found to present any advantages over the free acid as an antiseptic or disinfectant.

Memoranda:

MEDICAL, SURGICAL, OBSTETRICAL.

COLLOID SILVER IN INVETERATE PROSTATIC GLEET.

THE remarks of Sir M. Morris (BRITISH MEDICAL JOURNAL, May 12th) on colloidal preparations afford me an opportunity of drawing attention to a mode of using argentum collosol which I have found useful—namely, its injection into the substance of the prostate gland.

Chronic gonorrhoeal prostatic gleet often defies remedies and occasionally leads to such ravages in the gland that prostatectomy has been done for the condition in America and on the Continent.

The chief difficulty is the impossibility—even by ionization—of getting medicaments into contact with the epithelium of the ducts, so long and sinuous are the latter, so peculiarly guarded are their mouths, and so replete with secretion. Moreover, residual abscesses and abscess sinuses are often scattered through the gland.

In such circumstances I have successfully injected the gland through the endoscope with the aid of vision. A hypodermic needle is set on a long silver tube. To the proximal end a small syringe is attached. The veru montanum is the landmark, and the needle is driven into the prostatic sinuses on each side, or, perhaps, on the side alone whence pus is seen to ooze. The proceeding is quite easy. By this means the ducts are transfixed and the drug is brought into direct contact with the disease.

Short of this, I employed for years alternate suctions and injections under pressure. That medicaments reach the ducts in such circumstances is proved by the prostatic threads remaining stained for a day or two, should a coloured drug (permanganate) be used.

Before employing any drastic treatment for the prostate, it is well to apply local anaesthetics and inject morphine and phenazone into the rectum.

London, E.C. JAMES MACMUNN.

Reports of Societies.

MAKING AND CLOSING OF COLOSTOMY OPENINGS.

AT a meeting of the Subsection of Proctology of the Royal Society of Medicine on May 9th, Mr. F. SWINFORD EDWARDS, the President, being in the chair, Mr. P. LOCKHART-MUMMERY opened a discussion on the methods of making and closing colostomy openings. He said that with the advent of antiseptic surgery the necessity for an extraperitoneal route ceased and inguinal transperitoneal colostomy became the fashion, replacing lumbar colostomy, which had almost disappeared from surgical practice. The left lumbar operation had still a possible field of usefulness in cases in which a temporary colostomy preceded an abdominal section, and might still be the safest plan when there was obstruction and great distension of the colon with solid faeces.

Selection of Operation: Transverse Colostomy.

The inguinal operation as described by the Allinghams held the field until a few years ago. The modifications devised by Witzel, Braun, Bailey, and Weir, to produce a valvular opening failed to attain their object. This was true also of Lienthal's operation, in which a twist was given to the bowel. A very great improvement was introduced by making a vertical section through the belly of the left rectus. He had followed this method since 1907, and now never used the oblique incision in the left iliac fossa except when some very special reason precluded the use of the rectus incision. It gave better control over the opening, especially when the patient stood or walked. The following factors in performing the operation were of chief importance: (1) Bringing out the colon through as small an opening in the abdominal wall as possible; (2) making a good spur and subsequently completely dividing the bowel; (3) bringing the bowel through the rectus muscle; (4) providing a reservoir for the faeces immediately above the opening. The last could not be secured in the case of sigmoid colostomy without incurring the risk of prolapse, but was possible in transverse colostomy, which had recently come into considerable favour; it had certain advantages. By making the opening in the ascending part of the transverse colon towards the splenic flexure an excellent reservoir was provided for the faeces immediately proximal to the opening. Prolapse of the bowel was very unlikely to occur. In most cases excellent results as regards control were obtained, but he had met with at least two cases in which the stools had remained persistently loose after transverse colostomy.

Temporary Colostomy.

With regard to the best form of temporary colostomy, he did not think there was much to choose between the transverse and sigmoid operations. Transverse was certainly preferable as a preliminary to excision of the rectum, as the surgeon had the whole of the sigmoid to use in restoring the bowel, and the opening was further away from the site of operation. Apart from this, he favoured sigmoid colostomy as a temporary operation, but it was important that the centre of the sigmoid loop should be used so that the colon could be readily mobilized when the opening had to be closed again.

Closure.

There was still considerable difference of opinion as to the best method of closing a colostomy opening, and quite a number of operations with this object seemed to be failures. He thought that the best method was to dissect the bowel out from the abdominal wall, free the loop sufficiently to allow the colon to be drawn well out of the abdomen, and then, after cutting away the edges of the opening, to restore the lumen by direct suture. He attached considerable importance to the following procedures in the method he employed:

1. Before commencing the operation the external mucosa is either sterilized thoroughly or dissected loose and the opening temporarily closed with suture.
2. An incision having been made around the opening it is deepened on one side until the abdominal cavity is opened; then with one finger inside the abdomen as a guide, the bowel is freed from the abdominal wall with scissors.
3. The loop is drawn through a hole in a towel, and after being clamped on the proximal side a wedge-shaped piece of bowel, with its apex towards the mesenteric attachment, is cut away so as to secure a good blood supply and compensate for the narrow lumen at the site of the join.
4. The ends are sewn together with a catgut stitch, taking up all the coats, and a serous stitch, also of catgut, is placed over them.
5. The bowel is cleaned carefully, and, the gloves and instruments having been changed, is replaced in the abdomen.
6. The abdominal wall is closed with a small rubber tissue drain at the lower corner of the wound.
7. After operation the bowels are not confined, but are kept acting daily by small enemata or small doses of magnesium sulphate by the mouth. The advantages of this method were obvious, but good technique was essential.

The oldest and easiest method was by dividing the spur with an enterotome, and subsequently closing the external fistula by paring away the edges, inverting them, and bringing together the abdominal wall by deep sutures. The method was safe and the results were good. If safety were the only consideration, the patient being a bad risk, he thought that it was probably the best method. Greig Smith's operation left the gut inside the abdominal wall, and with a narrowed lumen. The patients generally suffered from chronic constipation and a weak place in the abdominal wall which required a support. Coffey's operation was open to similar objections. With regard to the young men wounded in the war for whom it was necessary to close a temporary colostomy it was most desirable to use that method which would give perfect anatomical restoration of the parts.

For the purpose of estimating the degree of control over the opening he had taken fifty cases and classified them according to the amount of control possessed at the end of three months after operation, as follows: (1) Excellent control, the patient being able to live an ordinary life

without the fear of an accident occurring; (2) good control, the patient living an ordinary life, but with occasional accidents; (3) poor control, the patient having to be very careful, and accidents being not infrequent; (4) bad, where control was absent. Out of the 50 there were 17 cases with excellent control; of these, 15 had either had the growth removed or the colostomy had been for a non-cancerous condition; in 4 of these transverse colostomy was done. Twenty-three cases had good control; of these, 13 were of inoperable cancer. In 6 cases the control was poor; 5 of these were inoperable cancer; 2 were transverse colostomies. In 4 cases the control was bad; of these, 2 were inoperable cancer and in 2 the growth had been removed. One was a transverse colostomy. In percentages the result was excellent in 34 per cent., good in 46 per cent., poor in 12 per cent., bad in 8 per cent. When the patient was in good health, with no growth, and not old, the colostomy did not cause serious inconvenience in the majority of cases, and with few exceptions the cases in which such inconvenience occurred were those in which an inoperable growth existed and the patient was old and feeble.

DISCUSSION.

Mr. SAMPSON HANDLEY agreed that the opening in the rectus sheath was a great improvement. The sigmoid was not a very suitable bowel to employ, and the transverse colon should be chosen. This was particularly true in the case of very stout patients, when the sigmoid could only be brought out with great difficulty; the transverse colon was, moreover, further from the growth. The anterior layer of omentum sometimes introduced a technical difficulty in transverse colostomy, but this could be got over by scratching through it. He had no strong views as to the relative advantages of the extraperitoneal and intraperitoneal methods of closing the openings.

Mr. A. BALDWIN said that the patient in these cases should not be subjected to more in the way of an operation than was absolutely necessary. He had always used a modification of Greig Smith's method, and thought that the degree of narrowing of the bowel was negligible. He had not met with constipation after it.

Mr. F. SWINFORD EDWARDS said that fifteen years ago he had adopted hypogastric as opposed to iliac colostomy, and had found the control excellent in many cases. He preferred it to transverse colostomy, which was not always easy because of the omentum lying before it, which was sometimes very thick. He had always used the extraperitoneal method of closure suggested to him by Mr. Baldwin, a small margin of skin being left all round.

Reviews.

GLAUCOMA.

THE interest that has been aroused in the treatment of glaucoma has produced a notable literature within the last few years. This is reflected in the added space given to the consideration of the disease in the standard textbooks and in the number of clinical essays appearing in the medical press. This little book by Lieutenant-Colonel R. H. ELLIOT, entitled *Glaucoma*,[1] is a useful contribution to the means of information at the disposal of the general practitioner, and one calculated to furnish him with a ready and exact means of appreciating the conditions, the mode of treatment, and the dangers attending the disease. The book is simply and clearly written and free from controversial discussions. After a general explanation of the nomenclature in use, a clear account is given of the anatomy of the parts concerned in glaucoma, and this is illustrated by excellent photomicrographs and line drawings. The physiology of the circulatory fluids of the eye and the manner in which they maintain the necessary internal pressure are explained. An account of the tissue changes in the vessels and filtration spaces brings the normal conditions into connexion with the disease state, and leads up to a consideration of the causes and consequences of glaucoma and its diagnosis. The signs and symptoms of glaucoma are set out very clearly; especially to be commended is the simple paper-folding scheme which illustrates the cupping of the disc and the alteration this produces in the appearance of the retinal vessels at the disc. It might, perhaps, have been wise to have given more space to the discussion of "differential diagnosis." To the man who is not constantly treating affections of the eye the overlapping of the symptoms of conjunctivitis, iritis, and glaucoma, when these states are not full blown and unmistakable, may often cause hesitation and uneasiness as to the accuracy of his diagnosis.

The treatment of the disease both by drugs and operation is detailed on generally approved lines, and the operative section gives an account of the several methods most in vogue; the notice given to the value of massage in the treatment of chronic high tension is particularly to be commended. The last two chapters deal with secondary glaucoma, congenital glaucoma (buphthalmos), and juvenile glaucoma. The scope and purpose of the book have caused the author to write often in a dogmatic tone, but this affords no ground for criticism, more especially as Colonel Elliot states in his preface that he has in preparation a larger, fully documented work, the publication of which has been postponed owing to the call of the war.

[1] *Glaucoma: A Handbook for the General Practitioner.* By Robert Henry Elliot, M.D., F.R.C.S. London: H. K. Lewis and Co. 1917. (Pp. 60. 3s. 6d. net.)

NOTES ON BOOKS.

The Care of the Teeth, by Dr. A. T. PITTS,[2] gives a brief and business-like account of what the average man, woman, and child should know about the subject. Dental caries, as the author points out, is the commonest of modern diseases; yet it is very largely preventable, and the reader of this little manual will learn what he ought to do to conserve the teeth. The early chapters deal with the structure and eruption of the teeth; the causes and effects of dental decay are next considered, and the last chapters deal with the prevention of dental irregularities and decay.

In *The Health of the Skin*[3] Dr. G. PERNET gives a chatty and interesting description of the care demanded by hair and skin, illustrating his remarks with apt quotations from the poets, historical parallels, and travellers' tales. Beauty doctors, specialists in the care of hair and face, experts who will take twenty years off the looks, and other such by-products of idleness combined with wealth and conceit have been as common as they were in the ancient civilizations of Egypt, Crete, Greece, or Rome. Dr. Pernet's book may be praised as a sound corrective to over-carefulness; it sets out, no less well, the amount of attention that the skin may duly claim. The volume ends with a note on the advisability of the foot-bath; the reader will perhaps be reminded of the lady who, being reproached for her dirty hands, turned away wrath by the apology: "Ah, Monsieur, but you should see my feet."

Miss C. W. SMART has written an excellent account of the prevention and cure of *Bed-Sores*,[4] an affliction now happily as rare as it once used to be common among the bed-ridden and paralytic. Though the volume may contain little that is new, it gives a sound and practical account of the matter.

[2] *The Care of the Teeth.* By A. T. Pitts, M.R.C.S., L.R.C.P., L.D.S. Methuen's Health Series, edited by N. Bishop Harman, M.B., F.R.C.S. London: Methuen and Co., Limited. 1916. (Fcap. 8vo, pp. 117; 20 figures. 1s. net.)

[3] *The Health of the Skin.* By G. Pernet, M.D. Methuen's Health Series, edited by N. Bishop Harman, M.B., F.R.C.S. London: Methuen and Co., Limited. 1916. (Fcap. 8vo, pp. 113. 1s. net.)

[4] *Bed-Sores: Their Prevention and Cure.* By C. W. Smart, Matron of Waddington Hospital, Waddington, Yorks. London: J. Bale, Sons and Danielsson, Ltd. 1916. (Pott 8vo, pp. 52; 6 figures. 1s. net.)

MEDICINAL AND DIETETIC PREPARATIONS.

Liquid Paraffin.

WE have received from the Stern Sonneborn Oil Co., Ltd., 16, Finsbury Square, E.C., a sample of "Elite" brand liquid paraffin, which this firm is now offering to the wholesale trade as a comparatively inexpensive article of high quality. On examination we find that the sample complies with all the tests of the *British Pharmacopoeia*, 1914, and that in some respects it attains an even higher degree of purity than the *Pharmacopoeia* requires; our results, therefore, confirm the claim that the article is of exceptional purity.

British Medical Journal.

SATURDAY, MAY 26TH, 1917.

RIDING FOR A FALL?

AN instruction was issued by the Recruiting Department last week directing recruiting officers to take no further action with regard to the calling up or posting of medical men under the notifications issued on April 18th–21st, until further orders from the War Office. Thus a satisfactory ending has been reached to an unfortunate episode, against which the Central Medical War Committee and the Committee of Reference felt called upon to protest, and the strain to which the machinery of the Committee was put has been relieved.

The general result of the new instruction issued by the Recruiting Department would seem to be that matters return very much to the position in which they were before the War Office took the step of calling up all medical men under 41 without discrimination. For the present, at any rate, every medical man called upon to take a commission will be asked to do so only on the advice and under the supervision of the Professional Committees.

We have spoken of the incident as "unfortunate," and we think that this term is fully justified, for the anxiety and uncertainty inflicted on individual medical men and the disturbance of machinery caused by the hasty action of the War Office could have been entirely prevented by proper co-operation and consultation between the military authorities and the bodies acting for civil practitioners. The information in the possession of the Professional Committees would have shown the Recruiting Department and the Army Medical Department that the issue of the instructions in April could only cause unnecessary disturbance and waste of time in the case of men who could not be spared from civil work; proper consultation would have ensured a total gain in commissioned medical officers at least as large without these disadvantages.

Sir Alfred Keogh, when he made his appeal in 1907 for the organization of the Territorial Hospital Medical Service, fully recognized that his scheme could only achieve success if it commanded the active and cordial co-operation of the medical profession. This it did receive, and the result of his foresight has been shown by the rapid and efficient organization of the Territorial general hospitals at the beginning of the war, and their expansion both on the spot and by means of auxiliary hospitals. Sir Alfred Keogh recognized that the medical profession was one body, though certain sections specialized for particular purposes, and recognized also that in a great national emergency it must act as one body. We are quite sure that he is of the same mind to-day, but in the stress of a war, the magnitude of which no one really foresaw, it is to be feared that the military machinery to meet the new conditions which have arisen has been strained, and we venture again to express the hope that the profession itself will take the matter in hand and quickly establish a method of co-operation between the military and the civil machines which shall ensure the efficiency of both and the rapid adjustment of difficulties which have arisen and are bound to become more acute in the future.

We are glad to find that in repeating this suggestion we have the support of Sir Donald MacAlister, who, in his presidential address to the General Medical Council on May 22nd, observed that while "the loyalty to national duty hitherto shown by medical practitioners as a body gives assurance that to the limit of their power they will respond to further calls should the needs of the country make further calls imperative," yet "to ensure the best results from their devotion, closer co-ordination of competing authorities and a more effective control of the actual distribution of medical services at home and abroad, are now much to be desired." Through such co-operation as is desired, and through it alone, can due consideration be given to the questions in which both military and civil interests are involved. At present there are signs that the military authorities are not attaching due weight to civilian interests, even in such a matter as medical services vitally affecting the supply of men and munitions for the army. Owing to the present want of co-operation the civilian committees are periodically confronted with demands for the withdrawal of more medical men from the civil side to serve on the military side, and the committees have in consequence considered it to be their duty to make sudden large calls for more medical officers for the army. By proper co-ordination it would be more possible to keep up a steady continuous flow of recruits, the best conceivable means of ensuring efficiency on both sides.

When a limited number of individuals, such as constitutes the medical profession, is called upon to furnish services essential to the nation but in two different directions—the military and the civil—at the same time, it is plain that if the demands of one side continue to increase, while the demands of the other side show no signs of diminishing, a point must be reached beyond which no amount of goodwill on the civil side can go. It would seem that this point, if not already reached, is not far distant; and that even if substitution—voluntary or compulsory—became practicable the period at which the supply will stop cannot be long postponed. As evidence for this view we propose to take three illustrations. In a district in England the Professional Committee has assented to the reduction to three of the medical man power for attendance on a population of 18,000, although there is no other doctor within ten miles. If one or two of the three medical practitioners fell ill it is difficult to see how the medical service of the area could be carried on. Our second illustration is from London; it is understood that the Committee of Reference is considering a scheme for closing some hospitals, and spreading the staffs remaining after the army has taken its toll, over fewer beds. If the total number of beds, after this process is complete, falls short by many hundreds of those usually available, the civilian difficulty will become very acute. Lastly, it appears that in certain cases where the members of the staff of a general hospital consists of Territorials *à la suite* (available on mobilization) who have taken the imperial service obligation, the Army Medical Department has lately called upon many of them to take service abroad. We understand that for the moment this fresh form of calling up has been suspended as the result of representations showing the difficulties in which the civil population would be involved; but the mere fact that its application has been contemplated in places already largely denuded of skilled assistance, without previous consultations with representatives of the civilian side, raises a serious question, for it must be remembered that though these Territorial officers are under military discipline, they

have continued to serve civil hospitals and to practise amongst the civil community.

If the time has come when the War Office and the Professional Committees consider it necessary to contemplate action in the directions we have just indicated, then the time has come for the medical profession, military and civil, acting together as one whole—a single body aiming at rendering similar services to the nation at this time—to grasp the nettle boldly. Sir Alfred Keogh said in 1907 that after every campaign there was a commission of inquiry to find out where things had gone wrong, and that the reports published about the medical service always seemed to make it quite clear that there was room for improvement. The Army Medical Service has done so well in this war—it has been extended by bringing in an immense number of civil practitioners with, until quite recently, very remarkable ease; it has succeeded in abolishing or reducing to an almost negligible proportion the sickness and invaliding due to those scourges of armies in previous wars, the enteric diseases; and it has handled the treatment and transport of wounded from trench to base hospital so efficiently—that nobody in his senses would ask for a royal or any other kind of commission or committee to inquire into its work for the army. But if from this time forward the utmost discrimination, founded upon careful examination of all the facts, civilian and military, is not shown in making further calls for military service upon the civilian profession, there are good grounds for the apprehension that the civilian public and civil Government departments may become alarmed, and that a demand will arise for an inquiry into the distribution of medical personnel between the civil and military sides. We do not pretend to forecast the direction which Government intervention would take; possibly the War Office might be forced into appointing a small committee, representing medicine, labour, and Government departments, as well as the War Office (for which there are several precedents), to make a speedy report, and such a committee might possibly be given certain executive powers; or there might be a move for an interdepartmental committee—a very unsatisfactory tribunal. But whatever form of committee were favoured, there will be before it only two alternatives. One is, to promote legislation for the mobilization of the medical profession, in order that the authorities might be able to enforce substitution. Some members of the profession would welcome compulsory substitution as a way of equalizing burdens. But such a scheme, applicable to one class of the community only, is one which no Government could contemplate without misgivings or would undertake unless convinced that it had public opinion behind it. The other alternative would be to exert such pressure upon the Army Medical Department as to make it reconsider the distribution of its medical officers. In our opinion, even if the objections to compulsory mobilization of one class were set aside and that method enforced, it could not postpone the day of difficulty for any great length of time. On the other hand, pressure upon the Army Medical Department is not likely to be effective without causing considerable unrest in it, and that is not advisable in the midst of a great war. The adjustment between the military and civil sides is a matter which should be settled by the medical profession itself—military and civil acting together—but, so far as we are aware, no definite steps have yet been taken by either side to bring about such co-operation. So long as it is lacking so long will the risk of interference from outside constitute a serious menace. We hope that the appeal of the President of the General Medical Council will be heeded. It is no time for procrastination on either side.

WATER PURIFICATION IN THE FIELD.

THE water problem of an army at war differs in a hundred ways from the same problem in civilian life. To the military sanitarian in the field every water is necessarily suspect, and his task has always been to devise a simple, rapid, handy method for making the foulest water safe and drinkable for troops on active service, whether in camp, on the march, in trenches, or in the thick of fighting. For years past the Army Medical Department and its scientific experts have laboured at this problem; to their credit it must be said that they grasped the bitter lessons of former campaigns, and applied them to the full in this war, with the happy results which all can see. The dangers of water-borne disease and the need for care in the matter of drinking water have been impressed upon officers and men of every branch of the army, and organized bodies of men, trained in their duties by medical officers, have vigilantly safeguarded the water supply at every point. As knowledge has been gained during the war from laboratory investigations and from practical experience, this has been used to perfect the technique of water purification. Old notions have undergone revision. Thus the test of practice under active service conditions has shown that certain methods, such as boiling and filtration, are difficult to use or unsatisfactory in their results. Chemical disinfection, on the other hand, which was formerly looked upon with less favour for routine purposes, has proved its value and practicability.

Chemicals have long been used, of course, for three distinct purposes in water purification—to clarify, to soften, and to disinfect. The last named alone need detain us. It used to be said in the textbooks of military hygiene that while disinfection by chemicals was theoretically promising, the difficulties of applying it to the conditions of life in the field were very great. Nevertheless, continuous efforts were made to develop the idea, and the chemical disinfection of drinking water has steadily gained in favour since the early months of the war. Of the chemical agents which have been tried at one time or another, chlorine and its compounds are by far the most important. Other members of the halogen series have been tried, but chlorine in the liquid state, or in the form of bleaching powder ("chloride of lime," calcium chloro-hypochlorite, $CaCl.OCl$), or of sodium hypochlorite, seemed to be the only one suitable for sterilizing water on a large scale. More than twenty years ago calcium hypochlorite was tried in a crude way in the Austrian army, but no attempt was made to overcome the disagreeable taste and smell of the water thus roughly chlorinated. The results did not encourage our own military hygienists to adopt the method at that time, although they recognized the strong germicidal effect of chlorine upon drinking water, and its advantages in this respect over permanganate, acid sodium sulphate, and even iodine. Twelve years ago, however, the sterilization of water by simple chemicals in the shape of hypochlorites was tried on a large scale in civilian life during a water-borne outbreak of enteric fever at Lincoln, with successful results. Between 1905 and 1911, as we learn from a valuable recent monograph,[1] Houston and McGowan

[1] *Rivers as Sources of Water Supply.* By A. C. Houston, M.B., D.Sc., F.R.S.Edin., Director of Water Examinations, Metropolitan Water Board. London: J. Bale, Sons, and Danielsson, Limited. 1917. (Sup. roy. 8vo, pp. 96. 5s. net.)

pursued the method further and treated the Lincoln water supply with an alkaline solution of sodium hypochlorite containing 10 to 15 per cent. of available chlorine; while since 1908, when Johnson disinfected the notorious Bubbly Creek water, at Chicago, with bleaching powder, the use of hypochlorites for sterilization has spread throughout the United States. In our own country progress by the civil water authorities along these lines has been slow, but the example set by the Metropolitan Water Board last year in its remarkable experiments with chlorination, and the success which has been achieved in the army, are bound to have far-reaching effects on civilian methods. In bleaching powder, as has been well said, nature and art have placed at our disposal a simple and invaluable means of sterilizing water on active service; the bulk and weight are very small in proportion to the amount of water which can be treated, and the use of a solid reagent has obvious advantages. It is also, we might add, a comparatively cheap method, and commercial chloride of lime is even less expensive than the corresponding sodium salt. One pound of bleaching powder in 33,000 gallons of water suffices to give one part per million of available chlorine, and in this strength the liberated chlorine can usually be depended on to kill off the germs of water-borne disease within five hours, the test being the total destruction of *Bacillus coli*. Effective treatment in this manner confers absolute, not merely relative, protection, and Dr. Houston maintains that properly chlorinated water is not only quite innocuous, but can also be rendered tasteless to all but the most fastidious of palates. Speaking of the future of water purification and the popular prejudice against "doctored" drinking water, he makes the significant remark that the war has taught many lessons, including the necessity of subordinating sentiment to expediency.

Early in the war Professor Sims Woodhead in these columns[2] reported that by experiments along the lines indicated above, which were first laid down in this country and then adopted on a large scale in America, he had satisfied himself that even a highly polluted water after ordinary filtration could be made perfectly safe and tasteless for drinking purposes by chlorination with bleaching powder, and that the amount of chlorine needed in any particular instance could be determined by means of the simple iodine and starch test which he described. Further practical investigations by Colonel Horrocks and others indicated a way of treating water with bleaching powder in the field, and the matter was vigorously taken up by the Army Medical Department. The fruits of this work have been incorporated in the sanitary organization for our troops in the various theatres of the war with the best results. Chlorination, preceded where possible by rough filtration, has thus come to be the normal method of water sterilization in the front area, and, indeed, on active service generally. The method has been standardized for the use of the water personnel of the army, and complaints on the score of unpalatability are, we believe, seldom heard.

So far we have spoken mainly of the disinfection of comparatively large volumes of water such as can be stored in tanks and water-carts or run in pipes from make-shift reservoirs. The purification of drinking water for scattered soldiers or small isolated bodies of troops has presented special difficulties, due partly to the deliquescence of chloride of lime and kindred chemicals in pellet form, and partly to the limitations of human nature. In another column Dr. Dakin and Major Dunham, of the United States Army Medical Service, describe a new substance which they have devised for the preparation of stable tablets for disinfecting polluted water by the individual soldier. Their paper illustrates the happy results which may follow investigations into a practical problem when they are carried out along strictly scientific lines, and, incidentally, the power the modern scientific chemist has over his materials, so that he can set to work deliberately to produce a substance fulfilling certain conditions as to activities and solubility which he desires to obtain. The substance which Dakin and Dunham, after several experiments, have selected as fulfilling both the biological and practical requirements of the problem is parasulphondichloraminobenzoic acid, to which, when made up into tablets, they propose to apply the convenient working name of "halazone." The substance can be easily prepared from accessible substances at small cost, and it is estimated that with it a hundred gallons of water—a quantity which would meet the normal demands of two hundred men for drinking water in a day—can be disinfected for one penny. The result of this research marks a further step forward in the task of safeguarding the health of all soldiers at the front from water-borne disease.

[2] BRITISH MEDICAL JOURNAL, September 19th, 1914.

THE PATHOLOGY OF CARDIAC DROPSY.

THE Oliver-Sharpey Lectures at the Royal College of Physicians were founded in memory of his famous physiological teacher at University College by the late Dr. George Oliver, who inaugurated the course by "Recent studies on the tissue lymph circulation" in 1904. It is therefore appropriate that Dr. Charles Bolton, Physician and late Director of Pathological Studies and Research, University College Hospital, should have the opportunity, as Oliver-Sharpey Lecturer for 1917, to sum up his investigations, spread over the last fifteen years, on the pathology of cardiac dropsy, which, from an experimental standpoint, supplement Sir James Mackenzie's Oliver-Sharpey Lectures in 1911 on the present-day conception of cardiac failure.

As it is impossible to produce gradual cardiac failure by experimental interference with the heart in its capacity as a force pump, Dr. Bolton adopted the alternative method of preventing the free diastolic filling of the heart, and eventually effected this by narrowing to two-thirds of its normal diameter the inferior vena cava of cats just below the right auricle. These experimental cats survive and rapidly show ascites, which is measurable after two hours, becomes considerable during the first few days, slowly increases till about the fifth week, and then, with the development of anastomoses, gradually subsides so as to disappear about the sixth month. The increased outflow of lymph constituting cardiac dropsy is one of the definite series of events due to failure of the cardiac pump. These circulatory changes occur in the following stages: (1) Accumulation of blood in the veins, causing a moderate rise of venous and capillary pressure and a fall of arterial pressure; (2) dilatation and engorgement of the veins and capillaries with a fall of blood pressure to the normal in the central parts of the body, and dropsy in the engorged area. The peripheral parts of the body become anaemic, and as a result increased absorption of water, causing simple hydraemia, follows; (3) vasomotor constriction, due to anaemia of the medulla, causes a rise to normal of the arterial pressure and a moderate rise of the venous

and capillary pressure in the central parts of the body; (4) hydraemic plethora supervenes and greatly increases the venous and capillary pressure in the same central area; (5) ascites and hydrothorax progress, oedema spreads peripherally, and true plethora occurs.

The abnormal output of lymph constituting the dropsy is primarily due to nutritional defect in the capillary wall and is increased by the general plethora and consequent high capillary pressure. In uncompensated heart disease in man the central portions of the body are relieved by gravity at the expense of the legs, which thus become included in the area of engorgement. The ascites is due to the increased flow of lymph from the viscera, more especially the liver, which persists as long as there is ascites; increase of the ascitic effusion depends on an increase, and a diminution on a falling off, in the rate of lymph output, for the absorption from the peritoneal cavity by the lymphatics remains constant. There is therefore continuous change in the peritoneal effusion.

Dr. Bolton has carefully refrained from any application of his experimental results to the practice of medicine, and, though this angelic caution is probably wise, especially in view of the title of his lectures, it may be hoped that he will, perhaps after further investigations, evolve precise directions as to the treatment of cardiac dropsy, and discuss the most promising means—for example, the limitation of the fluid intake. A dry diet is an old form of treatment, and has recently been revived, as is shown by Goodman's[1] interesting account of the Karell cure for dropsy of cardiac, renal, or hepatic origin. The patient remains in bed on a daily diet of 800 c.cm. of milk and no other fluid or food; a quarter of this amount is taken at 8 a.m., 12 noon, 4 and 8 p.m., and diuresis follows. The success of the cure has been variously explained by the restriction of the fluid intake, the low salt content, melting of the body protein, the absolute rest, or by a combination of some of these factors.

MILITARY ORTHOPAEDICS.

MILITARY orthopaedics as a special department of surgical practice has arisen during the course of this war, and its importance grows as each month passes and the number of maimed and broken soldiers mounts up. So large is their number, so serious the crippling, and so remarkable the result of appropriate treatment, that it has become a matter to which every practitioner should give attention. Dr. Colin Mackenzie's comprehensive survey of the principles and practice of modern military orthopaedic surgery, and the organization of the military orthopaedic hospitals of the United Kingdom, will therefore be read with particular interest. He claims, with pardonable pride, that the pioneer work upon which all modern practice is based was done in this country. In particular, the name of Hugh Owen Thomas, to whose genius Colonel Lynn Thomas paid a tribute in our columns on July 15th, 1916, and from whose writings Dr. Mackenzie freely quotes, is honoured wherever the surgery of deformities is practised. The principle was laid down by Thomas that the restoration of muscular function to the normal is the foundation of all orthopaedic treatment. He first grasped the full possibilities of the conservative treatment of joints, bones, and muscles by providing anatomical and physiological rest, and himself invented simple mechanical appliances for putting his ideas into practice. Before he fell out of the race Hugh Owen Thomas passed on the torch to Robert Jones, in whose hands the conservative or functional method has been perfected and its principles applied to new conditions both in peace and war. When the Army Council decided to organize the care and treatment of the deformed soldier upon a large scale, it was inevitable that Robert Jones, whose name is bound up with the modern surgery of nerve and muscle injury, should have been appointed Inspector-General of Military Orthopaedics. Dr. Mackenzie, in the second part of his paper, gives some idea of the scale upon which arrangements have already been made for wounded soldiers who come within the official definition of orthopaedic cases. It will be noted that he has the highest opinion of the value of curative workshops as an integral part of orthopaedic treatment, thus confirming the view expressed in an article on curative industries which we published on May 5th, 1917, p. 585.

[1] Goodman, E. H., *Arch. Int. Med.*, Chicago, 1916, xvii, 809-827.

MEDICAL MUSEUMS.

BY a coincidence the report of the last meeting of the American section of the International Association of Medical Museums has reached us in the tercentenary week of Elias Ashmole, a man "affected to the furtherance of all good learning," who, with the contents of John Tradescant's "closet of rarities," founded the first public museum of natural history in this country, and may almost be looked upon as the father of British scientific museums. Ashmole was born on May 23rd, 1617, at Lichfield, and lived an energetic and useful life. He was a Fellow of the Royal Society, and the University of Oxford—to which he presented his collection—made him a doctor of medicine. Although the Ashmolean Museum at Oxford has never held the place among scientific institutions of which its founder dreamed, his name deserves to be honoured for what he did for the furtherance of natural knowledge. The inscription on his tomb states that his name will endure as long as his museum, and so no doubt it will. A century later John Hunter, a far greater man, compiled his wonderful collection, which became the nucleus of the Museum of the Royal College of Surgeons of England, and gave an impetus to scientific research which has reached every civilized country. But although for many years past every school of medicine worth the name has possessed its own museum, it was not until the beginning of this century that the International Association of Medical Museums was formed, for the linking together of workers throughout the world, and the interchange of specimens and material for research. The association had its origin in America; subsequently local European centres were organized, and the British branch held its first meeting in 1911 in London. Nearly every curator and active museum worker in this country is now a member, and improvements in methods of museum technique, as well as a greater recognition of the medical museum as a teaching medium, have resulted. The last meeting of the American section, held in New York on April 5th, showed that the association is flourishing in that country. There was a large attendance of representatives from the leading medical museums and laboratories of the United States and Canada. In view of the declaration of war a resolution was passed offering to place the services of the society at the disposal of the American Government for any purpose of research and scientific organization. A committee was appointed to organize a central bureau for the permanent preservation of the results of scientific research, especially histological material, for the purpose of study by scientific workers throughout the country, and the president was empowered to confer with the councils of kindred societies in order to secure co-operation, and avoid overlapping, and the clashing of meetings. Valuable work has been done by a special committee, which inquired into the supply of standard glass specimen jars for museums throughout the continent of America. Arrangements have been made with an American firm to manufacture and supply these jars at a considerable saving in cost to members of the Museums

Association. The proceedings closed with discussions on museum technique and teaching and an exhibition of specimens.

THE AMERICAN MEDICAL UNITS.

THE first element of the United States army to arrive in Europe is a medical unit, which reached a British port last week, and will leave for the war zone very shortly. The unit consists of 23 medical men, in addition to the major and adjutant, both of whom belonged previously to the United States regular army; 65 trained nurses, and 155 orderlies, as well as four lady stenographers and others serving in subsidiary capacities, including a drum and bugle corps. It was organized for Red Cross work by Dr. George W. Crile, professor of clinical surgery at the Western Reserve University, Cleveland (who has already gone to France), and it has been placed under the command of Major Henry L. Gilchrist, chief surgeon of the 11th Division (22,000 troops) of the United States army. Major Gilchrist was serving on the Mexican border at the beginning of May, and was relieved in order to assume this new command. The order to go to Europe was received on May 3rd, and by May 6th 288 men had been examined and the 155 orderlies selected from this number and sworn in. During the same period the organization, which had originally been voluntary, was made a part of the regular army; every officer, nurse, and orderly has signed on for three years in the regulars and four years in the reserve. All the medical men in the unit, apart from Major Gilchrist and Captain Tuttle, the adjutant, are connected with the Western Reserve University, and in addition to Dr. Crile, they include Major Hoover, professor of medicine, Captain Karsen, professor of bacteriology, and Major Lower, of the Mount Sinai Hospital. Nearly all the professors of the medical faculty of the university are among the contingent. The nurses are mostly college women, many of them from wealthy families in the West, and 90 per cent. of the orderlies are also college graduates or undergraduates from the best universities of the Middle West, principally Ohio. Had it been authorized, a thousand such could have been enlisted at once. The unit left Cleveland on May 6th, arrived at an American port the following day, still in civilian clothes, and donned their khaki uniforms as soon as they were out of the harbour. Classes were started on board, and the men were schooled for ten hours a day. The future plans of the unit cannot, of course, be fully disclosed, but it can be said that they are immediately to take entire charge of one of the large base hospitals, consisting of 1,000 beds, and its present staff is to be relieved and re-distributed. It is hoped to devote special study to shell shock cases. Major Gilchrist, who gave these particulars, added that six special units from Boston and other parts of the States, with twenty-three medical men attached to each unit, would be sent, and as the United States had an abundance of medical men—1 in 699 of the population—he did not doubt that many more would be forthcoming. He had heard it stated that in all a thousand doctors would arrive within the next two months. On May 23rd, at Buckingham Palace, the King and Queen received the medical and nursing staff of the first American medical unit, whose official title is No. 4 Base Hospital, United States Army. Sir Alfred Keogh, G.C.B., Lieutenant-Colonel F. W. Begbie, R.A.M.C., and Miss E. H. Becher, Matron-in-Chief Q.A.I.M.N.S., were in attendance, and the American surgeons were presented to His Majesty by the United States Ambassador. The King, in a few gracious words, expressed his pleasure and satisfaction at meeting the first detachment of the American army which has reached our shores since their country resolved to take its part in the war; it was characteristic of the American nation that the first assistance rendered to the Allies should be in connexion with the profession of healing. On the same day a second contingent, comprising 26 surgeons, 60 nurses, and 250 orderlies, arrived at a British port.

STIGMATIZATION AND SUGGESTION.

A SHORT time ago Dr. Gosse of Poole asked if the statement made at a medical meeting that a blister was raised on the arm of a hypnotized patient at the Salpêtrière by pressing a clinical thermometer on the skin with the suggestion that it was burning hot could be authenticated. In a later communication our correspondent informed us that he had found the corroboration required in Frederic W. H. Myers's *Human Personality* (abridged edition 1907). He opens up a wider question by referring to the phenomena of stigmatization which are discussed by Myers in his chapter on hypnotism. Speaking of the effects of suggestion on the vasomotor system Myers says (in the original work, 1903, vol. i, p. 187) that "simple effects of this type form the commonest of 'platform experiments.'" What is generally known as "stigmatization," from the fact that its earliest spontaneous manifestations were suggested by imaginations brooding on Christ's passion, was long treated both by scientists and devotees as though it must be either fraudulent or miraculous; now, however, it is found to enter readily within the ever-widening circuit of natural law. "Stigmatization," said Myers, "is in fact a form of vesication; and suggested vesication—with the quasi-burns and real blisters which obediently appear in any place and pattern that is ordered—is a high development of the same vasomotor plasticity of which the ammonia-rose-water was an early example." In an appendix Myers gives a number of references to cases of blistering by suggestion, but in none of them, it seems to us, is the element of conscious, subconscious, or unconscious deception wholly excluded. It was shown by James Braid (Milne Bramwell: *Proceedings of the Society for Psychical Research*, vol. xii) that the alleged action of magnets, metals, and medicines in sealed tubes noted at the Salpêtrière owed their supposed virtue to suggestion, and this view was confirmed by other observers. The greatest care is needed to avoid error on this slippery ground and the will to believe often leads the most honest inquirer astray. Charcot was a clinician of the most penetrating insight, but the dramatic instinct was highly developed in him, and his demonstrations of hypnotized patients at the Salpêtrière made hypnotism fashionable. But after many years spent in the study of hypnotic phenomena he found that the proportion of truth in them was as the poor half-pennyworth of bread to the intolerable deal of sack in Falstaff's tavern reckoning, and he gave the whole thing up in disgust. With regard to blisters in particular, we may recall the fact that Luys made a number of experiments in the Charité Hospital, Paris, by the application of sealed tubes containing alcohol, pilocarpine, spartein, pepper, and valerian, to the skin of the neck, and claimed that in this way these substances produced the symptoms of tipsiness, sweating, and so forth. It was shown in the report of a Committee of the Paris Académie de Médecine, presented in 1888, that when the experimenters did not know what substances they were using no specific results followed. Some years later Mr. Ernest Hart showed that Luys was deceived by his subjects, who confessed the fraud; an account of the exposure is given in *Mesmerism and the New Witchcraft* (London, 1896, p. 101 et seq.). In an article entitled "The Eternal Gullible," which appeared in the *Century Illustrated Monthly Magazine* for October, 1894, and is reprinted in the same volume, Mr. Hart related the confessions of a professional medium who had, as he said, come to see the error of his ways. Before an informal committee of medical men the interesting penitent gave, in Mr. Hart's house, a demonstration of his methods. He said that at St. Mary's Hospital a doctor had raised a blister on his arm, as the operator fancied, by suggestion, and he explained the trick as having been done by rapidly biting and sucking the skin of the wrist. He went through the performance at Mr. Hart's house, and with some difficulty succeeded in raising a slight

swelling, but one of the witnesses assures us that the marks of the teeth were plainly visible. Seeing how easily even men with a scientific training are often deceived by the most vulgar tricks, the hypnotic showman may almost be forgiven for saying, with Autolycus, "Ha! ha! what a fool Honesty is and Trust his sworn brother, a very simple gentleman!" As for stigmatization, the classical instance is St. Francis of Assisi, but Dr. Imbert-Gourbey, in his book, *Les Stigmatisées: Palmé* (1873) enumerates 145 persons, all but twenty of whom were women, who are said to have received the stigmata. Paul Sabatier in his *Vie de St. François d'Assise* (Paris, 1898), speaking of the saint's stigmata, says the testimonies are at once too numerous and too precise not to carry conviction; but he does not admit their miraculous nature. He points out that the generally accepted account of them as bleeding wounds is not historically accurate. All the early documents describe those on the wrists and feet as fleshy excrescences resembling nails in shape and colour; only the one on the side was a wound from which oozed a little blood. The famous case of the Belgian "extatic" Louise Lateau is fully discussed by Dr. Charbonnier in his *Maladies et Facultés Diverses des Mystiques* (Brussels, 1875); he shows that her stigmata could be explained without reference to supernatural influence. The case mentioned by Myers, in which, according to Dr. Biggs of Lima, cruciform marks with the words "Sancta" above and "Crucis" below them were produced by his suggestion, seems to us unworthy of serious notice; the elusive grammar alone is sufficient to excite suspicion. Stigmata are by no means confined to holy persons. Dr. Toussaint Barthélemy's *Etude sur le Dermographisme ou Dermoneurose Toxivasomotrice* (Paris, 1893) contains much curious learning on diabolic stigmatization, with illustrations of the devil's seal, his claws, stamps of Satan's hand, and other examples of what he calls "dermographism by suggestion and auto-suggestion."

MILITARY HOSPITALS IN THE FUTURE.

IN a pamphlet entitled *The Medical and Nursing Services of the Imperial Army*,[1] Sir James Kingston Fowler sketches in outline a scheme for the organization of military hospitals in preparation for war, based upon the sentiment which clings round the medical schools of the empire. After a brief account of the present medical organization of the army in the field, and of the service of Territorial general hospitals at home, he lays down certain conditions which should be fulfilled in any scheme of military hospital organization. The method, in his opinion, should be independent of the form of military service, whether voluntary, compulsory, or Territorial; it should be elastic and capable of unlimited expansion; and it should be applicable to the whole empire. The feeling of *esprit de corps* and attachment to hospital and university should be utilized; and to this end Sir James Fowler proposes to name the military hospitals after the medical school, university, or town supplying the personnel, and forming in each case the bond uniting the individual members of the staff to one another. The number of hospitals for which each centre would be responsible would necessarily vary. Continuity of administration would be secured by a permanent staff, with an officer having R.A.M.C. training as commandant, and the organization of the nursing profession would follow similar lines. The author claims for his scheme that it would have the advantages of decentralization, and would maintain a direct association between the army and the medical schools and universities, and through them between the army and the whole medical profession. He puts it forward in the hope that it may serve to stimulate imagination and thought, and tend towards united effort and efficient service for the army.

[1] London: Macmillan and Co., Ltd. 1917. Price 3d.

CURATIVE AGRICULTURAL WORK.

DR. BERGONIÉ, professor of clinical electrotherapy at Bordeaux, is the latest and one of the most unexpected converts to the superiority of work with a purpose over so-called mechano-therapeutic methods. At a recent meeting of the Académie des Sciences he laid stress upon the superiority of agricultural work, especially for men who had been engaged on it before they were wounded. In agricultural work the intolerable monotony engendered by the repetition of purposeless movements that do not entail any effort of the will is absent, although at the same time when once the particular operation is started the movements in field labour are largely reflex, so that fatigue is diminished. At his hospital at Martillac, with 125 beds, he has substituted agricultural work for all mechano-therapeutic methods, with results that appear to him much more satisfactory. The medical officer prescribes the kind of movement required and fixes the hours of labour. He must, however, take care that the patient does not make shift to avail himself of other muscles or joints than those it is desired to exercise, nor have recourse to irregular mechanical solutions which would tend to hinder the return of function. The results have been most satisfactory, both morally and physically. From 80 to 90 per cent. recovered. Though this treatment is particularly applicable to subjects accustomed to agricultural pursuits it is often useful for others.

MOTHERS' PENSIONS.

BY invitation of the Earl of Lytton, Chairman of the State Children's Association, members of both Houses of Parliament met, on May 17th, to hear a description by Judge Neil, of Chicago, of the scheme of mothers' pensions which has been adopted in thirty out of the forty-eight United States of America. The scheme had its origin in the juvenile courts, which were first set up in Illinois in 1898. These courts were empowered to take away from their mothers children under 14 who were not receiving proper care. It was found that 75 per cent. of these cases of improper care were traceable to the widowed or deserted mother's inability to provide the necessaries of life. By an amending Act, largely due to the exertions of Judge Neil, judges of the juvenile courts were given discretionary power to make maintenance grants to the mother herself, instead of to an institution or to another woman. On purely economic grounds, and apart from the need of every child for a mother's love, it was found that the cheapest person to hire to look after the child was its own mother. Of the mothers who came before the juvenile courts experience showed that one-third did not need supervision, one-third would give proper care under supervision, and only one-third would not give proper care whatever was done to help and guide them. During 1916 money grants amounting to 10,000,000 dollars were given to mothers of 100,000 children. Had these children been sent to institutions it is estimated that the taxpayers would have had to pay from twice to three times the sum. This takes no account of the women who have been saved by not breaking up their homes, and the children who have been put in the way of becoming better citizens by remaining under their mothers' care. The amount of the pension in each case is settled, within statutory limits, by the judge, and the work of supervision is carried out by probationary officers of the court. Everything is done to maintain the mothers' self-respect and to avoid any slur of pauperism. The result has been a marked improvement in the health of mothers and children, and a steady decrease in juvenile delinquency.

AMERICAN medical men on war duty in this country are invited to make use of the library of the British Medical Association, 429, Strand, London, W.C. The library is open from 10 a.m. to 5 p.m., and on Saturdays till 2 p.m.

THE Council of the British Medical Association has made arrangements whereby books on all branches of medical literature and general science can be obtained on loan by members of the Association free of charge (other than for postage) from the Lending Department of the Library of the Association. Books so issued will be the latest editions. These facilities are in addition to those previously available to members for borrowing medical journals and periodicals, scientific reports of hospitals and laboratories, transactions of societies and congresses, and public reports. Copies of the Rules, and all other information, may be obtained from the Librarian, 429, Strand, London, W.C.2.

Medical Notes in Parliament.

The New Pensions Warrant for Officers and Nurses Postponed.—Sir A. Griffith-Boscawen, Secretary to the Pensions Department, said on May 21st, in reply to a question by Colonel Yate, that it had been found necessary, since the draft warrant for officers had been submitted to the Treasury, to consider certain of its provisions further. He could not say when the warrant would in these circumstances be issued, but he hoped very shortly. It was a very difficult document to formulate, and to wait a little time to get it right was much better than to bring it in prematurely. The warrant would also include provision for nurses.

Payment of Civilian Doctors in V.A. Hospitals.—On a question by Sir William Collins, Mr. Forster said that very large numbers of civilian doctors had rendered and were rendering medical service in Voluntary Aid Hospitals. If a civilian doctor, in the exercise of his own discretion, saw fit to claim payment for his services, the General Officer Commanding had power under War Office instructions to allow suitable remuneration, having in view the circumstances of each case; and in that event the grant to the hospital in question would be increased by an equivalent amount.

Volunteer Field Ambulances.—Mr. Macpherson informed Sir William Collins that the formation of field ambulances for home service on a volunteer basis had been approved, and offers of service had been invited from certain counties. If the result proved satisfactory the scheme would, it was hoped, be extended. The appointment of medical officers was proceeding, but it was not free from difficulty owing to the demand for medical officers for service overseas and for full-time service at home. This had necessitated the imposition of certain restrictions as to age upon candidates for volunteer appointments.

Pensions v. Gratuities for Discharged Soldiers and Sailors.—In reply to Mr. Wardle in the House of Commons, on May 17th, the Minister for Pensions said that the members of the tribunal to hear appeals from decisions awarding gratuities to soldiers and sailors discharged as medically unfit were: Lieutenant-General Sir A. E. Codrington, Admiral Sir Wilmot Fawkes, Mr. Bilton Pollard (Royal College of Surgeons of England), Dr. Norman Moore (Royal College of Physicians of London), Mr. A. Bellamy (National Union of Railwaymen). He hoped to obtain the services of a distinguished retired Lord Justice as president.

The Medical Examination of Female Prisoners.—In reply to questions as to the alleged illegal order of the Brentford magistrates for the medical examination without their consent of two women committed to Holloway Prison the Home Secretary said: I have made inquiries into this case and am informed that the magistrates did not order an examination of the two women referred to in questions. The women were charged with disorderly behaviour, and the magistrates, after hearing part of the evidence, remanded them for inquiries, and endorsed upon the committal order a statement that the justices would be obliged by the opinion of the medical officer as to whether the women were suffering from disease. I have informed the magistrates that in my opinion this request should not have been made. In consequence of the magistrates' request the two women were medically examined at Holloway Prison, with the result that they were reported by the deputy medical officer to be free from disease. The prison medical officers have definite instructions that no woman is to be examined without her consent, and I am assured that in this case the necessary consents were obtained. On the hearing of the case being resumed, the magistrates dismissed the charge. It appears from the information given to me that no illegality was committed, but I desire to repeat that in my opinion there was no reason whatever why the magistrates should have asked for any opinion from the medical officer, and I regret that the request was made. In reply to a further question as to the medical examination of girls due for discharge from Aylesbury Gaol, Sir George Cave promised inquiry.

The Venereal Diseases Bill.—The Venereal Diseases Bill as amended in the House of Commons came up in the House of Lords on May 22nd, Lord Rhondda moving that the amendments be agreed to. Exception, however, was taken to the substituted clause regarding the sale of drugs, Lords Haldane and Parmoor raising the question whether the change altered the original provision in that matter. It will be remembered that as the bill was presented and passed through its stages in the Lords the clause would have prohibited the offer or sale of drugs or other preparations as remedies for venereal disease except on the written prescription of a duly qualified medical man. The substituted clause which Mr. Hayes Fisher accepted in Grand Committee at the instance of Mr. Glyn-Jones would in effect prohibit any announcement or recommendation verbally or by label of any remedies or preparations. The point raised in the Upper House on Tuesday was whether this left the door open for a chemist, if asked specifically for preparations, to supply them without written prescription. After a discussion occupying about ten minutes it was resolved that Lord Rhondda's motion should be deferred to enable further consideration of the matter.

Medical Committee of Reference.—In answer to Sir William Collins, Mr. Macpherson said that the Committee of Reference was composed of the following: The President of the Royal College of Physicians was chairman, and the other members were four Fellows of the Royal College of Physicians, and the President and four Fellows of the Royal College of Surgeons. This committee was appointed under Section 7 of the Military Service Act, 1916 (Session II), and the Military Service (Professional Committees Regulation) Order, 1916, as the Committee of Reference for the purpose of Section 7 of those regulations. The members of the Committee were appointed by the Royal Colleges of Physicians and Surgeons, and approved by the Army Council. Their powers and duties were contained in the regulation mentioned.

Medical Students in the Army.—Asked by Mr. E. Harvey whether any further steps had been taken to release medical students now serving in the army, Mr. Macpherson stated that fourth and fifth year students could be released, their employment in the army was not considered desirable, as it was thought better for them to wait until they could be commissioned as medical officers.

War Pensions Statutory Committee.—Sir A. Griffith-Boscawen informed Major Chapple that the War Pensions Statutory Committee was continuing its functions, its relations with the Ministry of Pensions being governed by Section 3 of the Ministry of Pensions Act, 1916. He added, however, that this matter was under the consideration of the Government.

Artificial Limbs for Disabled Soldiers.—Taking up an inquiry by Major Chapple, Sir A. Griffith-Boscawen said that practically no artificial limb making was undertaken by the Military Orthopaedic Hospital at Shepherd's Bush. The hospital authorities stated that they made Syme's foot, a peg leg, and an artificial Duralumin leg. With regard to splints, it was estimated that they were produced at about 50 per cent. below the ordinary price, but the estimate was for salaries of instructors and for part of the cost of materials only, and took no account of the capital cost, the labour which was supplied by the patients, or the wear and tear of machinery.

The Medical Inspection of School Children.—Mr. Herbert Fisher, the President of the Board of Education, said, in answer to Sir Francis Blake, that the expenditure of local education authorities upon the school medical service was not taken into account for the purpose of the new supplementary grant. Prior to the war the authorities were rapidly developing this service. The war had necessarily stopped this development, but he had no reason to anticipate that it would not be resumed as soon as normal conditions were restored. The need for co-operation between the school medical service and agencies for child welfare and similar organizations had been frequently emphasized in the reports of the Board's chief medical officer, and local education authorities had taken various steps in this direction.

THE CAMPAIGN AGAINST VENEREAL DISEASE.

SIR WILLIAM OSLER'S ORATION.

ON May 14th, the president, Mr. D'Arcy Power, being in the chair, the Annual Lettsomian Oration of the Medical Society of London was delivered by Sir William Osler on "The campaign against venereal disease." The orator said that Nature in the form of disease was more fatal to man than man with his weapons. The needless deaths of peace far exceeded those of the most disastrous wars. More people died of plague in two years in India than had been killed on both sides since the great war began. In 1915, while nine of our soldiers abroad died every hour to save their country, twelve babies died at home in the same time to the scandal of their country.

The story of the conquest of the great infections was the brightest single chapter in the history of science. There was a fly in the amber, of course, as one looked in two directions—towards cancer and towards venereal disease.

Fallacy of Venereal Statistics.

Among infections syphilis and gonorrhoea stood alone. Against all other diseases man waged keen warfare. They presented the remarkable and subtle combination of man and Nature in an incessant and successful propaganda against the health of mankind.

The first thing to arrest attention in the Registrar-General's report for 1915 was the absence of all reference to venereal disease in the "Review of the vital statistics for the year 1915," by Dr. T. H. C. Stevenson. Of eighteen causes of death specially discussed all but three belonged to the infections, of which tuberculosis and pneumonia headed the list—but not a word about syphilis. Syphilis had been, and remained, the despair of the statistician. Trustworthy data were not forthcoming. Even in death a stigma was associated with it, and the returns were everywhere but under the special caption of the disease itself. In a list of eleven causes of infant mortality during the first year syphilis was not mentioned. Syphilis was stated to have been responsible for 1,885 deaths at all ages, and other venereal disease for 61. Of the 1,885, 1,162 were under a year, 1,277 under five years; of the ten best killers among the infections syphilis came last. Content at this stage, the superficial reader would have a very erroneous idea of the position of venereal disease in the nation's life.

The Case against the Gonococcus.

The gonococcus was not a great destroyer of life, but was the greatest known preventer of life; one of its cruel properties was to sterilize a very considerable proportion of its hosts. As high as 25 per cent. of the major operations at gynaecological clinics and hospitals for diseases of women might be for gonorrhoeal complications, which were among the commonest sources of chronic ill health. Conservative estimate placed the percentage of sterility in women due to gonorrhoea at 50. A large majority were innocent victims of infection by husbands who thought themselves free from all traces of what they regarded as a harmless indiscretion of youth, and who could have been cured under a proper system of control and treatment. The complicating epididymitis in the male was another common cause of sterility. One recalled the dictum of Noegerrath, "90 per cent. of sterile women have husbands who have had gonorrhoea."

From the standpoint of race conservation gonorrhoea was a disease of the very first rank, and cost the country annually thousands of lives. With 30 to 40 per cent. of all cases of congenital blindness, with the chronic pelvic mischief in women, and with the unhappiness of sterile marriages—with these and many minor ailments scored up against it, we might say that while not a killer, as a misery producer Neisser's coccus was king among the germs.

The Heritage of Syphilis.

The frequency of transmission of the spirochaete of syphilis from parent to child stood out less as a biological peculiarity than as a fact of supreme importance in the national health. The spirochaete might kill the child *in utero*, a few days after birth, or within the first two years of life, or the blighted survivor might be subject to innumerable maladies.

The stillborn were at last to be numbered. Until now they had remained the "hidden untimely births," to use the language of Job. Sir Arthur Newsholme estimated them at close upon 100,000. What percentage of these deaths were spirochaetal we did not know, but we knew that syphilis was, perhaps, the most common cause of abortion, and, from examinations made at large maternity hospitals, more than 25 per cent. of the stillborn had been found infected. Rejecting the larger estimates, the stillbirths due to syphilis might be put at, say, 20,000 for the year 1915. Of the first 10,000 cases at the special clinic of the Johns Hopkins Hospital there were 705 fetal deaths—that is, from the seventh month onward. In all cases the placenta was examined as well as the fetus. "By far and away the most common etiological factor in the production of death in the fetus is syphilis" was the conclusion; it was responsible for 26.4 per cent. in the series. In addition, at least 53 of the 127 macerated fetuses were probably syphilitic, though this could not be determined microscopically.

In 1915 of 800,000 children born, 90,000 died within the first year. If this were added to the intrauterine deaths it made stock-raising for the human animal a very poor business. About one-fifth of these died within the first week, and one-fourth within the first month. Ten causes were mentioned, but again the interest of the list centred in what was not there—syphilis was not even mentioned! When we turned to the total deaths from syphilis, then we did get light, as among the 1,885 deaths 1,162 were under one year, 1,277 under five years, but these figures were far below the mark. Careful work was in progress to determine the number of deaths within the first year from syphilis, and we should not be far wrong in placing the figure at between 15,000 and 20,000.

Latent Syphilis.

The second point in the biology of the spirochaete was a peculiarity it shared with many other parasites of resting dormant in the body for years. Its capacity to work evil was not to be measured by years. Since Schaudinn's great discovery there was a sharper point to Sigmund's aphorism, "Syphilis is the worm that never dieth." *Venus impura* was a hard mistress—Venus of the long arm she should be called—as ten, twenty, thirty, even forty, years from the date of the infection the book bills were rendered, and she wrung the uttermost farthing out of her poor victims.

No insurance company to-day would take a man who had a positive Wassermann reaction. A good test of the importance of a disease was to take the thirty-seven volumes of the two series of the *Index Catalogue* of the Surgeon-General's Library, Washington, in which was indexed practically all medical literature between 1884 and 1917. In vol. xvii of the second series, issued in 1912, there were 207 double-columned pages of reference, against 117 pages in vol. xiv of the first series in 1893. No other single disease except tuberculosis had so much space devoted to it. The improved technique by which the spirochaete was demonstrated in the tissues and the serum reactions had opened a new chapter in our knowledge of the prevalence of the disease. The profession had read it with amazement, the sanitary authorities with bewilderment, but, best of all, the public was actually reading the chapter in the open.

The Statistics Unravelled.

From the Registrar-General's report, of the 562,000 deaths in 1915, about 58,000 were due to disease of the nervous system. Two of these needed no discussion: locomotor ataxia and general paralysis *were* syphilis, and accounted for 735 and 2,263 deaths respectively. A certain number of cases classed under meningitis were syphilitic. After locomotor ataxia came "other diseases of the spinal cord," 2,846 deaths, a larger proportion of them in the fourth to the sixth decades. Any neurologist would say that a reasonable estimate would ascribe at least one half of these to syphilis—say 1,500. By far the largest single cause was cerebral haemorrhage, 25,423—a majority of the deaths occurring after 50, beyond which age it was the privilege of any man to rupture a blood vessel in his brain without suspicion; 3,713 of these deaths were between the ages of 25 and 50, of which 3,400 could be claimed as due to syphilis. There were 1,472 returns under the caption of "softening of the brain," and who could deny 500

of these as syphilitic? The "paralyses" without specified cause—2,983 cases—was a hopeless section, but as more than two-thirds were hemiplegia we could add at least another 500. That a certain proportion of other forms of mental alienation—1,100 deaths—were cases of general paralysis of the insane was very probable. From epilepsy, infantile convulsions, and "other diseases of the nervous system" which mount up to about 15,000, we could claim for syphilis 2,000 at least. This gave a total from this section of about 10,000 deaths in which syphilis was the probable cause.

The spirochaete attached itself to the vascular system in preference to all other parts. Aneurysm and the aortitis on which it depended were usually spirochaetal. Between the twenty-fifth and the fifty-fifth years the cases were always spirochaetal. Of the 1,141 deaths we could put down 1,000 to syphilis. There was a terrible bill opposite organic disease of the heart—56,000 deaths. About 17,000 of these were between the ages of 30 and 55, and a majority of these were in men. We should be safe in taking one-third of the cases between 30 and 55—say 5,000 at least—and we might take an equal number from the 10,000 dead of diseases of the arteries, atheroma, and aneurysm. A low estimate would put the cardio-vascular deaths due to syphilis at above 10,000.

It was unnecessary to bring in the comparatively small number contributed to other organs. We had enough to put the grand total of the ravages of the *Spirochaeta pallida* above 60,000, and to move syphilis from the tenth place in the Registrar-General's report to where it belonged—*at the top, an easy first among the infections.*

In all parts of the world investigations were in progress dealing with the incidence of syphilis in ordinary hospital work. Dr. Warthen investigated the tissues in a series of consecutive necropsies with the most scrupulous care to determine the existence of the spirochaete. One-third of the autopsies in adults showed its presence somewhere in the organs. Of these 41 cases, only 11 were known to have had syphilis, 5 had active lesions in the nervous system, and 25 had shown no clinical changes suggestive of syphilis. In 36 there were syphilitic lesions in the heart, 32 in the aorta, 31 in the testicles, 4 in the liver, and 6 in the adrenals. He concluded that interstitial myocarditis, aortitis, and fibrous orchitis formed a triad distinctively syphilitic. After quoting other investigations, the orator said that modern researches led to three conclusions—first, that there is an immense body of latent syphilis in the community; secondly, that a very large number of persons have not been thoroughly treated; and, thirdly, that to the enormous groups of cerebro-spinal and cardio-vascular deaths syphilis is an all-important contributor.

The Dawn of Action.

Centuries of silence had made venereal disease taboo. The beginning of the twentieth century saw us in a condition of hopeless apathy. Within a decade what a changed attitude in profession and public! The Royal Commission appointed in 1913 gave practical expression to a realization of the importance of the problem by the public. Best of all, Lord Sydenham's report had not been sterile. An outcome of the work of the Commission was the founding in 1914 of the National Council for Combating Venereal Diseases, the primary function of which was educational. The work of the Eugenic Education Society had been most helpful. The outset of the great war had stimulated, not retarded, the plan of campaign. War meant an enormous increase in the number of infections. The last quoted figures for the British army at home were 71,000 cases of gonorrhoea, 21,000 cases of syphilis, and 6,000 cases of soft chancre. In the Canadian army there had been enough cases of venereal disease to stir public opinion in the Dominion to boiling point.

These various agencies had at last the desired effect. The Government felt that opinion in the country was strong enough to act on the advice of the Commission, and hand over the venereal problem to the public health authorities, represented by the Local Government Board. Legislation had been enacted to fight the enemy in a settled plan at many centres under its control. It was a new departure to deal with an individual disease in this way. The word "may" instead of "shall" in the Tuberculosis Act gave us an ineffective guerilla warfare of local bodies instead of a Kitchener and a general staff. The Government made no mistake this time, and all over the country the clinics were in course of formation. No more hopeful legislation had ever been enacted than the establishment of these venereal clinics. But let the people and their representatives realize that they were dealing with the subtlest foe of humanity and the greatest sanitary problem which confronted civilization.

Organization of the Campaign.

A general staff, controlling the campaign, would work from the Local Government Board (or before long, he hoped, from a Ministry of Health), with laboratory, statistical, and several service departments, a publicity bureau and a library. Already the Commission had opened the doors of the general hospitals to these victims. The profession welcomed the scheme from the educational side, as there would be within easy reach opportunities for the study of all aspects of both disorders, and from the practical side they would be able to bring their patients freely for special treatment, for consultation and for the laboratory tests. There would, he hoped, be at each centre lectures and demonstrations. A sympathetic and loyal feeling on the part of the practitioners in each district was really essential to the success of the work. Between the clinical and the laboratory side there would be enough at each clinic to occupy a large part of the time of a male or female doctor, who would, he trusted, become the skilled advisers of the profession and of the public in each district. These positions should be made sufficiently attractive to catch the very best, and he was sure the hospital authorities would welcome them as members of the staff. A great missionary field would be opened to women doctors, who should do the work among their own sex at the clinic. Social workers of the right sort with the right spirit would do much to make the clinics known and appreciated. The National Council could supervise this work, which should be done by carefully selected volunteers.

The clinic should be the centre in each district of an active educational propaganda, which should be stimulated and planned by the general staff, and not left to the timid discretion of local authorities. By meetings, literature, placards—in every legitimate way—a knowledge of the dangers of venereal disease should be distributed, and the importance of early and thorough treatment insisted upon.

Compulsion or Persuasion?

For any legislation to be successful the people must be prepared. We were committed to a campaign of education and an elaborate scheme of treatment. Two circumstances made it probable that these measures would not suffice to reach the enemy. So deep was the stigma associated with the disease that patients avoided hospital and even their family doctors. To be successful in any fight the primary essential was to know where the enemy was placed. Realizing as fully as any one the strong arguments against notification, the gravity of the situation overweighed with him all private considerations, and he felt sure that within a year we should be ready for the change. It worked well in the Scandinavian countries, and the results from those Australian dominions in which it had been introduced would be interesting.

The other point really more serious was also connected with notification. Both syphilis and gonorrhoea required protracted treatment, and the primary symptoms were often so slight that it was impossible to get patients to continue a course of medication lasting a year or more. Reports from a Boston hospital showed that 28 per cent. of the patients did not return, and to a New York venereal clinic 29 per cent. of the syphilitics came but once. To be successful in this fight we must have control of the patients—the treatment must be compulsory; it was so in the army. If the House of Commons represented outside opinion, the public was a long way from appreciating the appalling risks they ran. The Government was committed, for a time at least, to a policy of persuasion, feeling that notification and compulsory treatment were too far in advance of public opinion.

For the first time in history the outlook was bright. The public was at last awake to the necessity of an educational campaign. That the preaching of chastity appeared a ghastly failure in face of the record of 800,000

fresh cases annually in this Christian kingdom was no reason why the earnest appeal for personal purity should not take the first place in the educational campaign.

That the State had at last intervened was another ground for hope, and most hopeful of all was the changed heart of the people. At last the sinner was to receive Christian treatment.

THE LISTER INSTITUTE.

The annual general meeting of the Lister Institute of Preventive Medicine was held on May 16th, when Surgeon-General Sir David Bruce, C.B., chairman of the governing body, presided. The report of the governing body showed that the Institute had again been actively engaged in war work, both in the production of serums and vaccines, and in the prosecution of research on problems arising out of the war. In the bacteriological department Dr. Schütze and Mrs. Barratt had prepared large quantities of typhoid, paratyphoid, cholera, melitensis, and plague vaccines for military purposes, over 40,000 c.cm. of these having been issued to the War Office, Admiralty, and Australian Imperial Force.

At Elstree, under the direction of Dr. MacConkey, assisted by Miss Homer and Dr. Zilva, large quantities of various serums had been prepared for the naval and military authorities, and, in addition, two kinds of univalent antimeningococcus serum had been prepared, and proved to be efficacious for curative purposes. Satisfactory accounts of the usefulness of antidysentery serum supplied regularly every month to the War Office had been received from Sir John Rose Bradford, consulting physician with the army in France. In the director's department at Chelsea Miss Chick, assisted by Miss Rhodes and Miss Dalyell, had continued the preparation of agglutinating, haemolytic, and anti-human precipitin serums, and the examination of cultures derived from cerebro-spinal meningitis and various intestinal infections. In the same department Miss Chick, assisted by a number of other ladies, had made a series of investigations into the distribution in food materials of the accessory substances which prevent beri-beri and scurvy, with special reference to the suitability of these foodstuffs for incorporation in the rations of the troops, and the biochemical department had taken a share in similar experiments dealing with the best way of drying foodstuffs, the presence of accessory factors in beer, and the chemical nature of these elusive substances. In the entomological department Mr. Bacot, who has been appointed honorary adviser to the War Office on entomological questions, has been largely employed in testing insecticides for use at the front. During the year the Institute made a grant of £500 to a committee for the study of tetanus formed by the War Office under the chairmanship of Sir David Bruce, and placed a research room at its disposal. The main object of the committee is to study the occurrence and treatment of tetanus arising from wounds, and experimental work for it is being carried on in various laboratories. At the University of London Captain Golla, R.A.M.C.(T.), and Mr. Ransome are directing an investigation into the best mode of administration of tetanus antitoxin, the chemical nature of the toxin and the effect on it of various reagents, the mode of its distribution in the nervous system, and the treatment of infected wounds with antiseptics. At Oxford Professor Sherrington is inquiring into the relative value of different modes of injection of the antitetanic serum in arresting tetanus. At the Institute's department at Elstree Dr. MacConkey and Miss Homer have worked on the duration of the passive immunity conferred by a prophylactic dose of antitetanic serum, and at Chelsea Miss Robertson has investigated the presence of tetanus bacillus in wounds, both in cases showing and not showing clinical symptoms of the disease. Miss Robertson is now engaged, in collaboration with Captain Tulloch, R.A.M.C.(T.), in a detailed investigation of organisms found in a large number of these cases having the morphological characteristics of the tetanus bacillus but not producing the specific toxin. Laboratories in the Institute had been placed at the disposal of the biochemical staff of the Medical Research Committee, of the Canadian Army Medical Corps, of the Australian Army Medical Corps, and of the Ministry of Munitions.

LONDON AND COUNTIES MEDICAL PROTECTION SOCIETY.

The annual meeting of the London and Counties Medical Protection Society, Ltd., was held at 32, Craven Street, Strand, on May 16th. The council's report stated that the work of the society had been but little affected by the war; any decrease in one class of cases dealt with had been counterbalanced by an increase in some other class. The membership of the society had remained almost stationary, and the financial position was satisfactory. Colonel E. C. Bensley, F.R.C.S., chairman of council, said that an alteration in the method of remuneration by the War Office for the medical examination of recruits had been made without the doctors being informed until afterwards when the question of payment arose. Instead of payment per head, the War Office issued an order limiting the fees for one day's work to a maximum far below the amount of the fees earned, on the scale agreed to, on days when the numbers were large. Medical men who objected to the alteration in the terms of their contract without their knowledge or consent had applied to the society, and the society succeeded in obtaining payment of a great part of the amount due under the existing contracts. The administration of the Insurance Act had given rise to many difficulties, and the society had had to adopt legal measures to protect some of its members against unjust surcharges. He also referred to the successful fight in the Court of Appeal which the society had made on behalf of a member who had attended a patient suffering from leprosy, and whose action, after the patient's death, in having the rooms disinfected drew attention to the nature of the disease and led to a claim for damages on the ground that the fact that the leper was in residence should have been disclosed to the landlord. The new departure entered upon in 1911 in regard to insurance against the costs of the other side and damages in unsuccessful cases had been of great advantage to the society. The risk, which formerly cost each member 10s. a year to insure against, was now undertaken by the society itself, and the excess of that risk over £1,000 a year was covered by an insurance with Lloyds underwriters up to £24,000. Sir John Rose Bradford was re-elected president and the vice-presidents were re-elected, together with Surgeon-General Sir George H. Makins and Professor Sidney H. C. Martin, to fill vacancies caused by the deaths of Sir Lauder Brunton and Sir James Goodhart.

THE WAR.

CASUALTIES IN THE MEDICAL SERVICES.

ARMY.

Killed in Action.

Lieutenant-Colonel W. B. Grandage, M.D.Cantab., R.F.A.(T.F.).

Lieutenant-Colonel William Briggs Grandage, R.F.A., who was in command of a brigade of the Royal Field Artillery, died on May 14th of wounds received in action half an hour earlier. He was 37 years of age and was the fifth son of Mr. and Mrs. A. Grandage, of Kent House, Rawdon, near Leeds. He was educated at Sedbergh School, Clare College, Cambridge, and St. Bartholomew's Hospital, and in his student days was a well-known Rugby football player. He took the diplomas of M.R.C.S., L.R.C.P. in 1905, and graduated B.A. and B.C. in 1906 and M.D. two years later. Before the war he was in practice in South Kensington and held the posts of honorary anaesthetist to the Victoria Hospital for Children, Chelsea, and clinical assistant in the gynaecological department of St. Bartholomew's Hospital, where he had formerly been house-physician. He held a captain's commission in a London brigade of the Territorial Force, R.F.A., prior to the war, was promoted major in August, 1914, and in April, 1916, was given the temporary rank of lieutenant-colonel. The injury from which he died was caused by a large shell bursting whilst he was walking from his own head quarters to that of an infantry brigade. An R.A.M.C. officer went to his assistance, but was told by the wounded officer to take shelter, as the enemy was sure to send over more shells. He was conveyed to a first-aid field post

where he died, his last words being a cheery message to his men. A former colleague writes: "Grandage's death in action when in command of a combatant unit will be deplored by a wide circle of friends. He was a very able, energetic man of strong personality, with a natural gift of leadership, which he developed in the football field and in the Territorial Force before the war. His gallant death creates a loss which will be felt not only in the army, but in the medical profession and the social life of London."

Died on Service.

MAJOR C. RYLEY, R.A.M.C.

Major Charles Ryley, R.A.M.C., died on service on May 4th, aged 40. He was born on April 25th, 1877, the only son of Charles Ryley, was educated at St. Mary's Hospital, and took the diplomas of M.R.C.S. and L.R.C.P. Lond. in 1901, also the D.P.H. of the London Colleges in 1904. After serving as house-surgeon of St. Mary's Hospital, and as house-physician of Paddington Green Children's Hospital, he entered the R.A.M.C. as lieutenant on July 30th, 1904, becoming captain on January 30th, 1908, and major on July 1st, 1915.

CAPTAIN J. F. ST. J. ANNESLEY, M.D., R.U.I., R.A.M.C.

Captain James Ferguson St. John Annesley, R.A.M.C., was killed whilst flying in an aeroplane on May 19th, aged 52. He received his medical education at Queen's College, Belfast, and graduated as M.D., M.Ch., B.A.O., R.U.I., in 1888. At an inquest held in Norfolk, evidence was given that Captain Annesley had expressed a desire to be allowed to go for a trip with a pilot in order to judge the effect of flying on the nerves, and that his request was acceded to. An air mechanic in his evidence stated that the machine, after passing over the road at a height of about 400 feet, banked and then dived to earth. On reaching the wreckage he found the doctor thrown clear, but the pilot was pinned beneath the machine. The jury returned a verdict of accidental death.

Died of Wounds.

CAPTAIN P. H. BURTON, R.A.M.C.(T.F.).

Captain Percy Herbert Burton, R.A.M.C.(T.F.), died on May 12th of wounds received the same day, aged 49. He was educated at the London Hospital, and took the diplomas of M.R.C.S., L.R.C.P.Lond., and the L.M.S.S.A. in 1914. After acting as surgical clinical assistant at the London Hospital he went into practice at Stansted, Essex. He joined the 4th (City of London) Battalion of the London Regiment, the Royal Fusiliers, as lieutenant and medical officer, on December 15th, 1914, and was promoted to be captain after a year's service. He was attached to that regiment at the time of his death.

Lost at Sea.

LIEUTENANT J. T. BROWN, R.A.M.C.

Lieutenant James Turner Brown, R.A.M.C., was lost at sea on May 4th. He was the only son of the late James Brown, Rector of Larkhall Academy, and was educated at Glasgow University, where he graduated M.B. and Ch.B. in 1911. After acting as house-surgeon of Glasgow Royal Infirmary he went into practice at Gravesend, and had only recently taken a temporary commission in the R.A.M.C.

Wounded.

Major T. W. Leitch, R.A.M.C.(T.F.).
Captain J. G. Brown, R.A.M.C. (temporary).
Captain J. H. Brown, Australian A.M.C.
Captain T. C. Clarke, R.A.M.C.(T.F.).
Captain E. S. Cuthbert, R.A.M.C. (temporary).
Captain C. A. R. Gatley, R.A.M.C. (temporary), attached to the Buffs.
Captain E. C. Gimson, D.S.O., R.A.M.C. (temporary).
Captain F. Harris, R.A.M.C. (temporary).
Captain J. M. Macdonald, R.A.M.C.(temporary).
Captain A. O. P. Reynolds, R.A.M.C. (temporary).
Captain J. M. Stalker, R.A.M.C. (temporary).
Captain D. J. S. Stephen, M.C., R.A.M.C. (temporary).
Captain J. L. Stewart, R.A.M.C. (temporary).
Captain H. S. Sugars, R.A.M.C. (temporary).
Captain R. A. S. Sunderland, R.A.M.C. (temporary).
Captain H. G. Willis, R.A.M.C. (temporary).

Missing.

Surgeon A. M. Russell, R.N.

DEATHS AMONG SONS OF MEDICAL MEN.

Brunton, Edwin Benjamin Durnford, Lieutenant Middlesex Regiment, only son of Dr. C. E. Brunton, Walthamstow, reported missing on November 13th, 1916, now presumed killed on that date, aged 23.

King, Thomas Shirley, Captain East Surrey Regiment, only son of the late Dr. Thomas Radford King, killed May 3rd, aged 35. He was born in 1881, educated at the Birmingham Oratory, and at Exeter College, Oxford, and took a commission in the beginning of 1902 in the East Surrey Militia, with which he served in South Africa, receiving the medal. Resigning in 1904, he entered the service of the Rajah of Sarawak, and served in that State for ten years. When the war began he returned home, and rejoined his old regiment. He was promoted to captain on March 16th, 1915, went to the front in March, 1916, was wounded in July, and returned to the front last January.

Owen, Iorweth ap Roland, Second Lieutenant Royal Flying Corps, son of Dr. Rowland Owen, of Seaforth, killed in action on May 7th, aged 20. He was educated at the Merchant Taylors' School, Crosby, and Mill Hill School. After matriculating at the University of London preparatory to studying for the medical profession, he joined the Inns of Court O.T.C. On obtaining his commission in August, 1916, he joined the Royal Flying Corps, and received his pilot's certificate on March 31st, 1917. He left for France on April 11th, and was killed whilst engaged single-handed against five German planes.

Paton, Edward Kesson, Second Lieutenant Machine Gun Corps, third son of Major Edward L. Paton, R.A.M.C.(T.F.), of Perth, killed May 3rd, aged 21.

Powell, George Henry, Second Lieutenant Machine Gun Company, killed in action on April 29th. He was the only surviving son of the late Dr. G. H. Powell and of Mrs. Powell, of Cookstown.

Powell, Robert Branks, Lieutenant Canadian Infantry, only son of the late Dr. Powell, of Oakdene, Victoria, British Columbia, killed April 28th, aged 36.

MEDICAL STUDENTS.

Bell, Cecil William James, Corporal R.A.M.C., officially reported "missing, believed drowned," was the only son of Mr. Andrew Bell, of Rathmines, Dublin, and was a first-year medical student at the School of Physic, Trinity College, Dublin.

Fishbourne, Derick Haughton Gardiner, Second Lieutenant R.G.A., reported killed in action on May 6th, 1917, was the only son of Mr. J. G. Fishbourne, Bank House, Tralee, Co. Kerry. He was a second-year medical student at the School of Physic, Trinity College, Dublin. Lieutenant Fishbourne joined the army in January, 1916, and at the time of his death was in his 21st year.

We regret to learn that Private Alan John Hosegood, 28th Battalion of the Canadians, son of Dr. Hosegood, of Cheslyn Hay, near Walsall, was severely wounded in the right forearm in France on May 9th. He has been admitted to the 5th Northern Hospital, Leicester.

[We shall be indebted to relatives of those who are killed in action or die in the war for information which will enable us to make these notes as complete and accurate as possible.]

NOTES.

HONOURS.

THE following medical officers are included in a further list of officers upon whom the President of the French Republic has conferred the decoration of the Legion of Honour for distinguished services rendered during the course of the campaign:

Croix d'Officier: Major W. H. Tucker, I.M.S.

Croix de Guerre: Captain J. Angus, M.B., Lowland Field Ambulance, R.A.M.C., Captain O. Teichmann, R.A.M.C., attached Worcester Yeomanry, Major M. F. White, M.B., I.M.S.

APPARATUS FOR RE-EDUCATION.

Privat and Belot,[1] in discussing the principles underlying the choice of a mechanical apparatus for the assistance of a partially paralysed limb, so that the best recovery of function may be obtained, take paralysis of the radial nerve as a text; they combat the view that no apparatus is desirable to balance the action of the flexors when extensor activity is deficient, holding that this would lead to greater weakness of the extensors and increased power of the flexors, and therefore an aggravation of the defect. They hold that it is necessary to distinguish between the anatomical and physiological activity of a muscle group. The anatomical activity of the extensor group is slight, but its physiological activity is of great range, and may be of great power. With such a variability of exercise as is here indicated, an instrument providing for only anatomical support would be wholly useless in work, the flexors would be uncontrolled, and therefore powerless, and the limb would become lost by disuse. They urge that no apparatus can be too powerful if it be calculated to provide an effective physiological substitute for the extensor control, for in all heavy tasks there are frequent occasions of superior activity of the flexors when the injured extensors will be forced by an effort of will to supplement the action of the momentarily overpowered apparatus, and these strenuous efforts will be re-educative in the highest degree. Instruments should be capable of easy interchange according to the nature of the work to be done.

[1] *Presse médicale*, 1916, p. 584.

England and Wales.

A CONFERENCE of representatives of approved societies under the National Insurance Acts from England, Scotland, Ireland, and Wales was held on May 21st, under the chairmanship of the Lord Mayor of Hull. A resolution was carried to the effect that a Ministry of Health should be formed, which should co-ordinate in a separate ministry all the health departments of the country, and that the National Health Insurance Commission should form the basis of the new ministry.

MATERNITY AND A MINISTRY OF HEALTH.

The Women's Co-operative Guild, Hampstead, has issued a memorandum on the national care of maternity, in which the immediate formation of a Ministry of Health, based on the public health side of the Local Government Board, with a strong and active maternity department, is advocated. The guild holds that it is only in connexion with general public health work that the needs of maternity can be fully met. The hardships of the working-class mother at the time of her confinement are described, and the corollary that such conditions react unfavourably on the child is emphasized. In order to improve matters the guild maintains that the care of the mother should have equal consideration with that of the infant, and for this purpose organized local health services and a money allowance are necessary. Maternity services, it is claimed, should be open to all whose health requires them; they must not be associated with Poor Law or inquisitorial methods; and the working women's help is essential to success. Beyond the direct care of the health of mothers and infants, indirect work connected with housing, sanitation, pure food and milk, should be linked up in the maternity department of a Ministry of Health. The principle is laid down that to secure satisfactory advice and treatment before, at, and after confinement, it should be arranged that every midwife has a doctor behind her, that every general practitioner has a specialist or consultant behind him, that adequate hospital accommodation exists, and that all should be closely linked with maternity centres. It is urged that the provision of dinners should be based entirely on the health needs of mother and child, and should be regarded as medical treatment. Finally, it is argued that an increase in the scope of health insurance to meet the needs of women has failed, and must always fail.

Scotland.

THE death is announced, at the age of 96, of Mrs Kennedy, of Dunain Park, Inverness. It is believed that she was the last survivor of those who had known Sir Walter Scott personally. She was the daughter of Dr. Alexander Gillespie, a well-known Edinburgh surgeon born in 1767, and an intimate friend of Scott. When a little girl Mrs. Kennedy played Scots melodies on the piano at Walter Scott's request.

PREGNANCY CLINICS AT THE EDINBURGH ROYAL MATERNITY HOSPITAL.

Early in March last the directors of the Edinburgh Royal Maternity Hospital, acting on the recommendation of the medical board, appointed Dr. J. W. Ballantyne, one of the hospital's senior physicians, to take charge of the pregnancy clinics to be held twice weekly in the hospital, under the City of Edinburgh's scheme for maternity and child welfare. The details of the arrangement were to be subject to revision at the end of a year, and Dr. Ballantyne was to continue to take charge of the whole work of the hospital in the autumn quarter of the year (July–September). A series of rooms in a block of buildings adjacent to the maternity hospital has been prepared for the accommodation of the clinics, and these rooms were informally opened on May 15th, when Dr. Ballantyne, with the assistants and nurses in charge, carried through the first clinic in the new premises. Formerly (for more than two years) there had been weekly clinics for expectant mothers in the basement floor of the hospital itself; but under the city's scheme the clinics will now be held twice weekly (on Tuesday and Friday) at 5 p.m. It is intended that these clinics shall be mainly consultative in nature, and that pregnant women who have attended one or other of the subsidiary maternity centres in the city, and have there been found to be suffering from any of the abnormalities of pregnancy, shall be sent to the hospital for further diagnosis, for advice, and it may be for residential treatment in the prematernity wards. At the same time patients may come directly to the clinics on the recommendation of medical practitioners or on their own initiative.

Ireland.

THE Kilkenny guardians resolved on March 26th to increase the salaries of medical officers in the union to £150 a year, rising by £10 every four years to a maximum of £200, and by a subsequent resolution made this scale retrospective to the doctors with over twenty years' service. The Local Government Board has notified its approval of the amended scale on the assumption that it applies only to the dispensary medical staff.

DOMICILIARY TREATMENT OF TUBERCULOSIS PATIENTS.

At the last meeting of the Dublin County Council a letter was read from the County Tuberculosis Committee stating that its experience had been that tuberculosis patients returning home after undergoing a course of institutional treatment rapidly deteriorated in health where their circumstances did not permit them to obtain a sufficiency of nourishing food. The committee, being convinced that expenditure on institutional treatment in such cases would be to a great extent wasted unless provision was made for after-care domiciliary treatment, had obtained the sanction of the Insurance Commissioners to the provision of extra nourishment in cases in which it was considered necessary. The cost of carrying out this extra treatment had amounted to £150 for the whole county. The Local Government Board had been notified by the Treasury that "while it will no doubt be generally agreed that the supply of special foods and medical comforts under medical direction should be deemed to be 'treatment,' their lordships cannot contemplate an application of the Exchequer grant to the provision of ordinary subsistence." The Local Government Board added that it was bringing the matter under the notice of the Treasury, with a view to further instructions. The Chairman said it was a waste of public money to send certain patients to an institution for treatment, and then after a period of detention to send them back to their homes of poverty, and very often homes of hunger. The committee felt bound to see that reasonably adequate means would be available to give them food in their homes. That had been done under the direction of the tuberculosis officers and nurses. There was no reason for thinking that any abuse in administration occurred. The Treasury, it appeared, would approve of giving these people cod-liver oil and patent food, and things of that sort, but they did not consider that Irish oatmeal, made from home products, and sweet milk produced on Irish soil should be provided. That was reducing administration to a farce, and if it was persisted in it would be his duty to advise the committee to reconsider its position, as it would be hopeless to carry on if these instructions were imposed upon it.

LUNACY IN 1915.

From the Report for 1915 of the Inspectors of Lunatics for Ireland we learn that in Ireland, as well as in the other portions of the kingdom, there has been a decrease in the number of lunatics coming under the supervision of the Government inspectors. On January 1st, 1916, the total number was 25,103 (13,070 males and 12,033 females), as compared with 25,180 (13,187 males and 11,993 females) on January 1st, 1915, so that the net decrease during the twelve months amounted to 77. This is remarkable in view of the fact that every year since 1863 an increase has been recorded, and it is pointed out as an encouraging circumstance that the decrease is to some extent due to a lessened admission rate. The decrease, however, has been limited to males, females showing an increase of 40 as compared with 1914. With regard to mental stress the inspectors remark that amongst the admissions for 1915 no less than 19.22 per cent. were attributed wholly or partially

to that cause, and in 13.16 per cent. this was assigned as the principal cause, as compared with 16.88 and 11.40 (respectively) in 1914. The general conclusion with regard to civilian cases is that in over 1 per cent. of the admissions of 1915 it was possible to attribute to war conditions some direct part in the causation, and a prominent part in 0.32 per cent.; and that women suffer more than civilian men from the mental effects of the war. The list as to the number of soldiers and sailors admitted to civil asylums during the war is necessarily imperfect, owing to the special arrangements made by the War Office for dealing with insane soldiers, but 34 men who had served abroad and 51 who had not so served were admitted during 1915, in whose cases the war was assigned as a cause or an associated factor of insanity. There was some decrease in the proportions of cases admitted in which alcohol was assigned as the principal cause. The rate, however, still remained higher than before the war. The number of patients discharged recovered was 141 less than in the previous year. This is equivalent to 38.2 per cent. on the admissions (2.7 per cent. lower). The deaths in 1915 numbered 1,676 (896 men and 780 women), being an increase of 201 on the numbers of 1914.

Canada.

TRINITROTOLUENE POISONING.

SEVERAL cases of trinitrotoluene poisoning have occurred amongst munition workers in Montreal. One case, that of a medical student who worked during the months of July and August, 1916, on the manufacture of trinitrotoluene, terminated fatally, and is reported in full in the *Scientific Reports of the Royal Victoria Hospital*, Montreal, Series B, No. 1, p. 203. It appears the vapours of toluene possess intoxicating or exhilarating qualities, and workers have exposed themselves voluntarily to these fumes in order to produce the effect of intoxication. This was done by the young man in question, who developed jaundice, and on account of increasing weakness was obliged to leave the factory. During the autumn he improved sufficiently to return to college, though still slightly jaundiced, but on October 18th was taken ill suddenly with profuse haemorrhages from the nose, bowels, and kidneys. He was admitted to hospital and died within forty-eight hours of admission. The *post-mortem* examination showed diffuse and profuse haemorrhages in practically all the parenchymatous organs, the whole pelvis of the kidney and the ureter were blocked by coagulated recent blood, and there were haemorrhages in the skin, pericardium, and intestines. The left lobe of the liver was much diminished in size, collapsed, flat, and extremely haemorrhagic; the right lobe was enlarged owing to parenchymatous swelling, which was greyish and produced a peculiar relief-map appearance of the parenchyma around depressed vascular channels. It is concluded from these findings that trinitrotoluene is not a parenchymatous but a vascular poisoning which injures the endothelium of blood vessels and lymphatics. Fatty changes, coagulation necrosis, and marked bile precipitation, were absent. An examination of the nitrogen partition of the urine of five cases of trinitrotoluene poisoning was made by Drs. Harding and Mason, of the Royal Victoria Hospital, Montreal, and the results are reported on pages 21–26 of the *Scientific Reports*. They found that the undetermined nitrogen was high in all cases and excessively so in three of them.

THE CARE OF LEPERS AT CANTON.

In December, 1909, a mission was founded at Canton by the Sisters of the Immaculate Conception, Outremont, Montreal, and from time to time since then a party of nuns has gone out to the East from the convent at Outremont; five sisters have left recently. In addition to the mission work, the nuns have established on an island a few miles from Canton a lazaretto, where about four hundred lepers are nursed and taught. The care of the lepers is undertaken by the nuns voluntarily, and cases of leprosy are sent to hospital by the Chinese Government, which makes a small grant towards the support of these patients.

HEALTH STATISTICS AND NOTES.

It would appear from the annual reports of medical officers of health and hospitals throughout the Dominion that from the point of view of the general health of the public the year 1916 was satisfactory. With the exception of extensive outbreaks of measles, usually of a mild type, no severe epidemics are reported. The absence of epidemics of typhoid fever is particularly encouraging, and is due, no doubt, to the efforts of municipalities to protect citizens by purifying the water supply, which in most places is taken from the rivers into which sewage is permitted to enter, by chlorination or otherwise. In St. John, New Brunswick, the death-rate from tuberculosis has been lowered from 186 per 100,000 in 1914 to 127.26 per 100,000 in 1916. The infant mortality is still high, particularly in Montreal, but a good deal has been done to improve matters by education and by the establishment of milk stations in the more crowded parts of the cities.

Much is being accomplished in the direction of educating the public in matters pertaining to health by the Institute of Public Health in London, Ontario, which is under the able direction of the M.O.H., Dr. H. W. Hill. The institute was organized under the Board of Governors of Western University, London, Ontario, in July, 1912. The fourth annual report shows that the work has grown rapidly; the staff, which in 1912–13 consisted of 5, now comprises 13 members; 400 specimens were examined during the first year, but 5,400 during the year 1915–16. Efforts have been made to interest all classes of the community. As in the laboratories of the Ontario Board of Health, specimens of sputum, diphtheria, cultures, typhoid blood, water, milk, and sewage are examined free of charge at the institute, and commercial analyses and clinical examinations of all kinds are undertaken upon payment of a small fee, or, in necessitous cases, upon the request of a physician, free of charge. The work of the institute is conducted in three divisions —epidemiology, with a subdivision of vital statistics; chemistry, with public health bacteriology and sanitary engineering as subdivisions; and pathology. In the future, "when public health has emerged from the struggle with disease into the greater field of developing health," to quote from the report, it is hoped that the present division of pathology will become a division of public health physiology. A course leading to the degree of D.P.H. is given at the institute.

South Australia.

(From our Special Correspondent.)

SINCE I last wrote there has been nothing of a very startling nature to communicate so far as this State, or indeed the rest of the Commonwealth, is concerned. Two bounteous seasons have followed upon a record drought, and although the wheat harvests have provided some records it will be years before the flocks and herds are replenished. Except that we do not get mails so frequently as of yore, and consequently see our BRITISH MEDICAL JOURNALS at irregular and fitful intervals, there might be no war going on at all so far as Australia is concerned. I mean no world-war. It is true prices are higher in every direction and wages have risen, but there is no famine nor even great scarcity. But Australia has found plenty of occupation. There have, I believe, been more strikes and trade disputes since the great war began than during the twenty years that preceded it, although medical and lodge questions are in abeyance. Mr. Hughes came back ready to enforce conscription and literally send the last man and expend the last shilling to aid the old country. But he had not reckoned with his own party, and now they have had a split, and we are in the throes of Federal elections. If our men do not know of an existence of a war the women at all events do. Our wives and daughters, sisters and cousins, are "manfully" striving day after day to alleviate the condition of our boys, whether in camp here or training on Salisbury Plain, whether baking in the deserts of Egypt or freezing in the trenches in France, whether invalided in the hospitals in England or returned damaged home. Socks (now often spelt "sox") and smokes, Christmas puddings and chutney, and a thousand

and one other comforts were sent by the ton. Nor amongst the recipients are the units of the Australian Army Medical Corps lost sight of.

The Medical School.

A year ago Dr. J. C. Verco decided to resign the lectureship on medicine which he had held for twenty-nine years—indeed, ever since the medical school was first established. The Council of the University appointed him to be Emeritus Lecturer and a member of the Faculty of Medicine. In his place Dr. Swift, the lecturer on clinical medicine, was appointed, he in his turn being succeeded by Dr. Frank Hone, an Adelaide graduate, and an assistant-physician to the Adelaide Hospital. Six members of the Faculty of Medicine are still at the war—namely, Lieutenant-Colonels Hayward, De Crespigny, Newland, Wilson and Downey, and Major Cavenagh-Mainwaring. As soon as our medical students graduate they are sent into camp, instead of, as formerly, becoming house-surgeons to the various hospitals.

The Profession.

Practitioners were mobilized in a sense in anticipation of conscription. Many have actually deserted their practices and gone to the front, such as Lieutenant-Colonels Powell and Corbin; others leave their work in the hands of colleagues, and take a month in rotation at the Adelaide Hospital, or the Keswick Camp. Others, again, serve on transport or hospital ships. Meanwhile, a locumtenent is indeed a *rara avis*. Several honours have been gained, especially by the juniors—Mentions in Dispatches, D.S.O.s, Serbian Military Crosses, etc.

The Branch.

With so many of our leading lights absent, it is no wonder that our proceedings seem a little flat, and yet our meetings in the Lister Hall are well attended, perhaps because the duty of providing a paper for discussion seems so frequently to fall upon Dr. J. C. Verco, who has been occupying the presidential chair for two years in succession. Several interesting contributions in the direction of war experiences and observations have been made by Lieutenant-Colonel Cudmore, Staff Surgeon Morris of the Naval Bridging Train, Major J. A. G. Hamilton, Captain Fooks, and others, and all seem to agree that some muddles have occurred which might have been avoided; but they recognize that in an enterprise of such magnitude some details will suffer, some supplies will be deficient, and some transport arrangements inefficient.

Correspondence.

A MEDICAL POLICY AFTER THE WAR: PART-TIME STATE SERVICE.

Sir,—It is not enough simply to recognize that, if English medicine is to retain its place in the world, it must primarily retain a reasonable amount of freedom; it is also, and urgently, necessary to determine, whilst time for deliberation is left to us, how that essential condition is to be ensured. That things medical will be left as they are after the war is exceedingly unlikely. Changes are as good as certain. What we have got to see to is that the changes will be for the better, not for the worse. The Insurance Act stands as a warning of what may happen if we are again caught unprepared with a policy.

The conditions of medical work may be any of the following:

1. Wholly independent.
2. Part-time local service.
3. Part-time State service.
4. Whole-time local service.
5. Whole-time State service.

1. *Wholly independent service* survives (so far as any work can be so described), and doubtless will continue to survive, in many private practices. There is little likelihood of immediate interference there; but for the huge section of medical work lately converted into "panel practices" no return to independent service can now be looked for.

2. *Part-time local service* sufficiently describes panel conditions and the work of the voluntary hospital staffs. In both of these there is great probability of change and we are urgently in need of a policy.

3. *Part-time State service* is just now widely existing in the hospitals throughout the country for the care of our sick and wounded soldiers.

4. *Whole-time local service* finds its chief example in the public health appointments, and its defects are the main argument for a change to a whole-time State health service, free from local interests.

5. *Whole-time State service* is the necessary condition of the administrative Army and Navy Medical Services.

Of these part-time and whole-time services, some of which presently will become the arena of a momentous struggle, the issue of which concerns the health at least of a generation, it may be said that whole-time local service has, in the case of public health, proved itself unsatisfactory, and has, in fact, little to recommend it for any sort of medical work.

For a few sections of medicine a whole-time State service is the only reasonable arrangement. The Army and Navy Medical and the Public Health Services are included here. But to convert the great bulk of medical activity into whole-time State service would assuredly be a disastrous procedure. The natural impulse towards strenuous progress would thereby be weakened. Competition in professional excellence and success would practically vanish. Ambition would be diverted into more questionable channels. "Why, then," it may be asked, "permit any whole-time State services at all?" "Because it cannot be avoided," is the obvious reply. And so long as the great mass of medical work is free from the damaging influence of whole-time service, the dominant healthy progressive influence of the mass will react on the comparatively small whole-time section, and do much to remove the natural tendency to stagnation.

We come, then, to consider the local and State part-time services. The most illuminating instance of part-time local service exists in the panel practice, with its partly semi-educated local control. Let us be quite clear about the nature of this control. Much umbrage was once caused by the statement that it is disastrous to place a skilled industry under the control of "inferior intelligences." Well, that great elucidator, War, has thrown some light on this question. And it seems unlikely that, for some time to come at any rate, the profession of English medicine, with its unsurpassed record of unselfish patriotism and superb achievement, will look for control and guidance to those sections, at all events, of the community, whose equally conspicuous selfishness and stupidity have again and again impeded and imperilled our soldiers at the front. This is no "class" question. It is a question of "training"—training of character and intelligence. The inferiority formerly referred to, so far as these sections are concerned, is now placed beyond question, with its corollary of unfitness for guidance and control. That control must cease. The local part-time service must be taken over by the State, when guidance and control will rest with intelligences of a higher order of training.

It is to *part-time State service* that I would venture to direct attention as the solution of several problems likely to arise as soon as the war is over. Its advantages are these:

(*a*) It leaves sufficient independent work to maintain a healthy progressive competition, avoiding the deadening effect of whole-time service.

(*b*) It provides control by trained and selected minds.

Three examples will indicate how it may be expected to work out—namely, in the voluntary hospitals, in the medical teaching centres, and in panel practice.

The *voluntary hospitals* are doing a vast amount of public work, in which the medical profession is asked to bear the elephant's share of the burden and to take the donkey's share of the credit. I question whether the continuance of this system as it stands is assured. The eyes of those who rightly regard a disunited calling as fair game are certainly upon these hospitals. I would suggest a State part-time service for the staff as having many advantages. A young physician or surgeon receiving, say, £300 a year for his work—instead of nothing, as it now is!—could afford to start consulting work without the possession of private means; that would remove from the consulting body of medicine the suspicion of being primarily a plutocracy. Then the certainty of this pay would remove both the distraction of financial anxiety and

the need for "pot-boiling" in the scientific output. Moreover, the work (such is human nature) would be likely to be better done, since the sense of responsibility is apt to be quickened by fair financial assessment. At the same time, such an income could only suffice in very early days, and all the present incentives would remain in ample force to stimulate to industry and enterprise.

Medical education cries aloud for some kind of State control. That the General Medical Council has not trodden far faster than it has (moving unconsciously along lines which its peculiar constitution has fixed) the primrose path of general-educational degradation, reflects the most signal honour upon its members. What is needed is a one-portal State examination and part-time State service for clinical teachers of medicine. Such men should be well paid and pensioned, and should have part time to devote independently to private consulting work as well as to the hospital practice which forms their clinical field for instruction.

Panel practice would not be less agreeable if the same (or higher, as they should be) emoluments proceeded from the State, and if the control of the medical officer passed from the hands of the inadequately educated into those of the adequately educated.

I indicate these examples as examples only. There are other departments of our work where the same arrangement seems desirable. Were medicine so organized, a Ministry of Health would be its natural centre. It has been long called for. Is it coming into existence? If so, and if it comes on the lines of the control and co-ordination of one of the vastest responsibilities of the future, by intelligences cultured and capable, well. If not on those lines, let us set ourselves with all our energy to prevent the advent of a tremendous evil.—I am, etc.,

Exeter, May 15th. W. GORDON.

ARMY AND CIVIL CO-OPERATION FOR MEDICAL ECONOMY.

SIR,—Your article upon army and civil co-operation is much to the point. A great deal could and ought to be done in this matter.

Mine is a case in point. My partner—a Territorial medical officer and at one time medical officer at the barracks—was called up in August, 1914. He was taken away from the district, and has often had very little to do. Most of this time I have had too much work. Two men are shortly leaving the neighbourhood, leaving more for us at home. There was no real reason why my partner should not have been given charge of the barracks instead of bringing a man away from another practice, as was done. He could have done a little private work in his spare time. The barracks work rarely takes the whole time of the medical officer.

Further, we now have a camp a mile from the town, at which there are a number of doctors who are by no means working all day. My partner might do the work of one of these men and have time to help a little at home. The army doctors are not even allowed to attend civilians in the camp. We are called out there to attend workmen, Y.M.C.A. workers, and the like. This sort of thing if happening in many places must lead to serious waste of doctors' time and energy.

We who are overworked feel that a little consideration on the part of the War Office would make it unnecessary for us to get so overstrained, and to expose ourselves to the risk of nervous breakdown. We cannot do our work efficiently under the present conditions of chronic overwork.—I am, etc.,

Richmond, Yorks, May 19th. H. M. EYRES.

SIR,—To those who have served, or are serving, in the R.A.M.C., the waste of men and money is very obvious, often due to want of thought or to lack of business capacity. Saving money by laboriously collecting empty stone inkpots, empty jam tins, etc., costing to collect as much as they are worth, while at the same time giving a luncheon to an inspecting officer at a remotely situated mess at a cost of £8 19s. 5d., is one example of many of the way in which money is wasted.

The number of medical officers in charge of small bodies of troops scattered about in country towns is very great, and there is no doubt that very many of them could be released for service where the need is more pressing by using the civil medical practitioners. The greatest obstacles to efficient and economical medical service are the "dug out" R.A.M.C. officers serving at home. Their strict adherence to the traditions of the service and to the inflexible rules of red tape prevent, or greatly hinder, really good medical work.

The War Office, or those at the heads of the various commands, are never content unless there is an overflowing complement of full-time medical officers in every district ready to cope with any possible emergency, however remote. We are told in the BRITISH MEDICAL JOURNAL that the proportion of doctors to the army strength is 1 in 400. This is all very well in theory, and if there were plenty of medical men to go round, would be a counsel of perfection; but is not so when it leads to the appalling scarcity of doctors in the industrial districts, where, from the nature of the work, serious accidents are common.

I know an isolated area whose 9,000 inhabitants are practically all workers in ironstone mines, blast furnaces, and munition works, which it is proposed to leave to one medical man; and another area of the same population or more, all ironstone miners except a scattered agricultural element, to be entrusted also to a single doctor. In both these cases three or four medical men could be well employed. How is it possible for one man to give anything like decent attention? Within a few miles are five R.A.M.C. officers looking after 1,800 soldiers, and having the greatest difficulty in filling up time.

Let the army use efficiently the men they already have before they call any more from their practices.—I am, etc.,

May 15th. LATE R.A.M.C.

MEDICAL BOARDS.

SIR,—I agree with your correspondent. At the beginning of the war I offered my services, and was told that this was the most useful way in which I could "do my bit." I have worked very hard, and never received a word of thanks but plenty of kicks. I am, like most of the men doing this work, retired and of independent means, and would not do it for one week for treble the pay but for patriotism, and would appreciate some kind of acknowledgement.—I am, etc.,

May 22nd. R. M. P.

SIR,—I entirely agree with your correspondent that it is quite time that something was done to improve the position of the members of medical boards. I have been acting continuously as a medical examiner of recruits since the beginning of the war, and on occasions have been on duty ten, twelve, and once sixteen, hours in a day in the earlier stage of the war. I can safely say I have never received the slightest recognition or word of appreciation from any quarter, official or otherwise. I have had no leave since my appointment as medical examiner. These remarks apply equally to some of my colleagues, who have worked on as cheerfully as possible actuated by patriotic motives, and we all agree that it would be a welcome change to hear from some quarter that our services were appreciated.—I am, etc.,

May 21st. EXAMINER.

CHILD MORTALITY.

SIR,—In my letter in the JOURNAL on May 5th I wrote: "It is not feasible for the State to cause an increase in infant life." I used the word "feasible" advisedly because it had reference entirely to the inception of life, and had nothing to do with life at any stage of its progress after that event. It is, of course, quite possible that parents might be found who were willing to renounce all claim to their children, and to hand them over to the care of the State immediately they were born; and in this, as well as other ways, the State might cause an increase in infant life, but schemes having this object in view are not, in my opinion, feasible.

It is an established fact, and one which even the Local Government Board itself recognizes, that a diminished birth-rate bespeaks invariably a diminished infant mortality, and the explanation is not far to seek. Most married women, it must be remembered, desire and are anxious not only to have but to rear at least one child, and she who so resolves and goes through the ordeals connected with motherhood will not readily as a rule run the risk of losing in early life the child for whom she has

made certain sacrifices, and in whom some of her future hopes are centred; consequently she is generally not unwilling to bestow some measure of maternal care and attention upon her infant, and for this reason a diminished birth-rate portends a diminished infant mortality. This question of maternal care and attention, embracing as it does not only the indoor but the outdoor life of the infant, is undoubtedly the secret to the solution of our infant mortality problem, but how best to deal with it is a very moot point, and it will most assuredly tax the ingenuity and skill of any statesman who resolves to grapple with it.

Unfortunately we are becoming too engrossingly a pleasure-loving and a pleasure-seeking people, and the pernicious influences associated therewith are the very influences which are undermining that form of family life which best conduces to the bestowal of that amount of maternal care and attention which is indispensable for the welfare of the child.—I am, etc.,

London, W., May 12th. JAMES OLIVER, M.D., F.R.S.Edin.

THE TREATMENT OF TRENCH FEET BY THE SUBCUTANEOUS INJECTION OF OXYGEN.

SIR,—The results described by Captain H. Oswald Smith in the JOURNAL for April 21st tell their own tale of unfailing success in averting by a simple and harmless method the worst evils of the prevalent and disabling affection for which the only remedy seemed to lie in prevention. By immediately allaying the pain, by quickly relieving the oedema, and by forestalling or arresting its destructive consequences, his treatment fulfils the ideal cure. Its value is not, however, limited to that satisfactory management of a condition special to the trenches and almost unknown in civilian practice. It has the significance of a novel departure in subcutaneous oxygen-therapy.

The original purpose of the method, to which the latest reference in this JOURNAL was an editorial review of its history,[1] was to furnish an artificial supply of oxygen for the blood when imperfectly arterialized owing to some disablement of the ventilating function of the lung. Partly with a similar view surgeons have recently availed themselves of oxygen in operative surgery of the abdomen and of the thorax. But the original idea was elaborated mainly in France, where it has been developed into a systematic method of treatment for pulmonary tuberculosis. The new departure consists in injecting the oxygen at the seat of the trouble, not for any general arterializing purpose, but for the sake of its action upon the lesion. The first question which arises is as to the mode of that action. Captain O. Smith specifies clearly two demonstrable activities: the mechanical or inflatory "gaseous" influence upon the tensely waterlogged swelling, and the physiological "oxygenating" influence upon the stagnant venous blood. Behind this lies a further question, perhaps only theoretical, but possibly fraught with unlimited practical utility—the question as to any direct, specific, biochemical action exercised by gaseous oxygen upon the tissues *in vivo*. Hitherto this line of investigation, which Mr. George Stoker has pursued clinically for many years for the cure of cutaneous ulcers, had been exclusively limited to the "open" method of oxygen ventilation. It has, at any rate, eventuated in our belated recognition of the factitious nature of the delay in healing of indolent ulcers treated under dressings, and of the supreme healing power of open air and of its oxygen. But we are still in the dark as to the action of "subcutaneous" oxygen upon cell life in health and disease. Captain O. Smith has now established beyond any doubt that artificial oxygen emphysema, which in the original method was regarded as an inevitable drawback, far from being destructive to starved tissues, is capable of rescuing them from incipient gangrene. For a variety of much less precarious surgical conditions this opens up the possibility of a safe trial of the injection of oxygen (and perhaps eventually of other gases or vapours); and incidentally it reminds us that everything has not yet been tried for cancer, even in its cutaneous variety. It will also give physicians much to think as to the future management of dropsy, when they look back upon the risks of our crude early methods of drainage by multiple puncture, by Southey's tubes and by deep incisions. The anaesthetic, and perhaps analgesic, action of oxygen is another aspect for study which conceivably might prove of much practical clinical value. The early "neuritic" stage of trench foot, still free from swelling, which has not been submitted to the new treatment, might furnish a special opportunity for observations in that direction.—I am, etc.,

London, W., April 28th. WM. EWART.

[1] BRITISH MEDICAL JOURNAL, 1915, vol. i, p. 973.

TREATMENT OF BRONCHIAL ASTHMA.

SIR,—Dr. Auld in his communication on asthma (BRITISH MEDICAL JOURNAL, May 5th) makes the following statement:

> I may be permitted, first of all, to make reference to the view as to the nature of bronchial asthma which I submitted in the course of a lecture on the subject in 1908. It was to the effect that the asthmatic attack is a reaction on the part of the lungs to a toxic substance, etc.

I consider this statement should not be allowed to pass without drawing Dr. Auld's attention to some literature on the subject which may have escaped his attention and may be of interest to him. Dr. James Adam of Hamilton published in 1913 a book on *Asthma and Its Radical Treatment*, and in its introduction (page 2) the following extract will be found:

> The book is an expansion of post-graduate lectures delivered in 1910 at Glasgow Royal Infirmary; these in turn were based on a thesis written in 1900, and published in Glasgow Hospital Report, 1901. The view expressed twelve years ago was that asthma resulted from two factors—a toxaemia and a lesion in the respiratory tract, etc.

—I am, etc.,

Glasgow, W., May 11th. HUGH MORTON, M.D.

THE BELGIAN DOCTORS' AND PHARMACISTS' RELIEF FUND.

SIR,—In spite of the fact that a circular has been issued stating that the National Committee for Relief in Belgium is ceasing to take part in the relief of the suffering in Belgium, this committee (the Belgian Doctors' and Pharmacists' Relief Fund), as the result of a letter received from the Commission for Relief in Belgium, has decided to continue to send £800 a month to the committee in Brussels. The letter contained the following words:

> . . . Every arrangement has been made to assure that the relief shall go on without interruption. Spanish and Dutch representatives will take the place of the Americans, and the actual handling of the relief cargoes, the distribution of money, etc., will be supervised by Belgian representatives of the Commission in a way which we feel confident will ensure the food and funds arriving at their proper destination. . . . I therefore hope that you will be able to continue the . . . contributions from your society as in the past. They have afforded great relief. . . .

—I am, etc.,

H. A. DES VOEUX,
Hon. Treasurer.

14, Buckingham Gate, London, S.W.1, May 22nd.

The Services.

ROYAL NAVY.

DEPUTY INSPECTOR-GENERAL ISAAC H. ANDERSON, M.D., has been awarded a Greenwich Hospital Pension of £50 a year in the vacancy caused by the death of Fleet Surgeon Fleetwood Buckle, M.D.

EXCHANGES.

M.O., attached to an infantry battalion in France, desires to exchange with a M.O. in an ambulance train, Red Cross barge, motor ambulance convoy, or fever hospital.—Address, No. 1549, BRITISH MEDICAL JOURNAL Office, 429, Strand, W.C.

Regimental Medical Officer, Ripon, desires to arrange transfer with medical officer, London district.—Address No. 1750, BRITISH MEDICAL JOURNAL Office, 429, Strand, W.C.

THE German military authorities have decided that it is incompatible with military interests for medical students to be granted furlough in order to resume their studies. Special facilities are, however, granted for their final examinations.

Obituary.

MAJOR GREENWOOD, M.D., LL.B., M.R.C.S., L.R.C.P., D.P.H.

MAJOR GREENWOOD, the eldest son of the late Dr. Major Greenwood who practised for nearly fifty years in North-East London, was born on April 29th, 1854, and died, after a long and trying illness, on May 16th. He was educated at Merchant Taylors' School and the London Hospital, took the diplomas of M.R.C.S.Eng. in 1876, L.R.C.P. Lond. in 1878, and graduated M.D.Brussels in 1887. He commenced practice with his father, but in 1890 entered into partnership with the late Dr. Frederick Wallace, and resided in Hackney Road from that time until his death.

Dr. Greenwood was a man of remarkable energy and versatility. Not content with the labours of a busy general practice, in the course of which he earned the respect and affection of both patients and colleagues, he applied himself energetically to the study of law, graduated LL.B. in the University of London, and was called to the Bar by Lincoln's Inn. He soon became a recognized expert on medico-legal questions, particularly those connected with Poor Law administration. At the time of his death he was Deputy Coroner for North-East London.

Few men have been more zealous in serving the interests of his brother practitioners or more loyal to the British Medical Association, of which he had been a member for many years. After serving on the Council of the Metropolitan Counties Branch he became a member of the old Parliamentary Bills Committee, and was elected a member of the last Central Council before the adoption of the present constitution. After the reconstitution Dr. Greenwood frequently served on the Central Council, of which he was continuously a member from 1910 until his death. He had served as one of the Representatives of the City Division at the Annual Representative Meetings, and was a member of the Medico-Political, Public Health and Central Medical War Committees.

All who have taken part in the active work of the Association will recall Dr. Greenwood's incisive personality, and the vigour with which he fought for principles deemed by him vital to the honour and welfare of his profession.

Dr. Greenwood was a man of wide literary culture. In 1915–16 he was president of the Metropolitan Counties Branch, and his scholarly presidential address, entitled, "Sidelights on the practice of medicine in the past from early English literature," was published in the JOURNAL of August 7th, 1915. Not to speak of various technical works, mostly on medico-legal subjects, he was the author of *John Armstrong*, a novel favourably reviewed and highly thought of by several good judges. He also possessed great skill in the composition of graceful verses, both in Latin and English. The history and literary associations of his native city were to him a source of life-long pleasure. One of his earliest published papers was an essay on The Great Plague in London, one of his latest, a poem on the history of the metropolis. Friends whose painful lot it has been to watch helplessly the advance of inoperable disease will recall how a well-timed literary allusion could rouse him from weariness and depression into an animated discussion of literary or archaeological topics.

In Dr. Greenwood the profession loses a fine example of the scholarly physician who never grudged time and labour spent in the service of the public and of his professional colleagues. He was an enthusiastic officer in the City of London Volunteer Regiment, and it was a source of bitter disappointment to him to be obliged by ill health to relinquish active participation in the work of his unit.

Dr. Greenwood married, first, Annie, daughter of the late Dr. P. L. Burchell of Kingsland Road, who died in 1904, and by whom he had three children; the eldest, a member of the medical profession, survives. Dr. Greenwood married again in 1906, Emily Maud, daughter of the late Mr. J. M. Pearle, who survives him. To Dr. Greenwood's widow and son the sympathy of the whole profession will be extended.

The interment took place at Abney Park Cemetery on May 19th, when the Council of the British Medical Association was represented by Mr. Guy Elliston and the Poor Law Medical Officers' Association and the London Panel Committee by Dr. A. Withers Green.

Dr. ARTHUR HAYDON, ex-president and now secretary of the Brussels Medical Graduates' Association, sends a tribute to the kindness and unfailing courtesy of Dr. Greenwood, by whom the association was founded thirty years ago. He had done good work ever since in looking after the interests of the graduates of the University of Brussels, not only in England, but in all parts of the world. It was mainly Dr. Greenwood's efforts some years ago that brought about the registration of the degree in the Transvaal, and he had always hoped for full reciprocity between this country and Belgium. Dr. Greenwood had been president of the association and at the time of his death was its treasurer. In 1915 he collected over £100 from members of the Brussels Medical Graduates' Association for the Belgian Doctors' and Pharmacists' Fund.

THE death is announced of Dr. H. W. WILLIAMS at his residence at Guilsborough, Northamptonshire, where he had resided for some time. He was born in 1836 and received his medical education at the University of Aberdeen, Birmingham, and Anderson College, Glasgow; he took the diplomas of L.R.C.P.Edin. and L.R.F.P.S. Glasg. in 1863, and graduated M.D., C.M.Aberd. in 1867. He was for many years physician to the Hospital for Consumption, Margaret Street, and practised as a consulting physician in London. He gave much attention to the prevention of inebriety and was one of the founders of the British Medical Temperance Association, vice-president of the Society for the Study of Inebriety, and a member of the British Medical Association. For thirty years he had been actively associated with the Salvation Army and had held the position of director of its medical department for twenty-seven years.

Dr. WILLIAM FINDLAY, whose death is announced, was born in Kilmarnock in 1846. He was educated at the University of Glasgow, where he was one of Lister's pupils, and graduated M.B., C.M. in 1870 and M.D. in 1878. He commenced practice at Dennistoun, and continued in that district until his retirement some ten years ago. He had held the office of president of the West of Scotland Branch of the British Medical Association, and was one of the founders of the Glasgow Eastern Medical Society. His chief recreation was literature, and he was one of the early members of the Glasgow Ballad Club. He was a great admirer of Burns, and was the author, among other works, of *Robert Burns and the Medical Profession*. He was himself no mean poet, and his collected verse was published in two volumes, *Ayrshire Idylls*, and *Carmina Medici: the Poems of a Physician*.

Universities and Colleges.

UNIVERSITY OF CAMBRIDGE.

AT a congregation held on May 19th the following medical degrees were conferred:

M.B., B.C.—K. B. Bellwood.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.

IT has been found impossible to bring into force in time for the election this year the new by-law sanctioned by the Council for sending out voting papers early enough to give Fellows abroad the opportunity of voting. A formal explanatory notice will appear next week.

ROYAL COLLEGE OF SURGEONS OF EDINBURGH.

THE following have been admitted Fellows: M. A'B. M'Carthy, H. E. Allanson, J. H. Cobb, G. W. Gower, E. R. Holborow, H. J. M'Caw, F. A. St. John.

The Bathgate Memorial Prize for materia medica, consisting of a bronze medal and books, has been awarded to Mr. L. P. Samarasinha.

CONJOINT BOARD IN SCOTLAND.

THE following candidates have obtained the Diploma in Public Health: Gladys Ward and Ella Elphinston.

A REUTER'S telegram from Petrograd announces that the Russian Government has ordered the mobilization of all women doctors under 45 years of age, except those with children under 3.

Medical News.

THE house of the Royal Society of Medicine will be closed on Whit Monday, May 28th.

WE have received from the British Thomson-Houston Company (Limited), of Rugby, a copy of their new Coolidge tube list. The Coolidge tube, since its introduction from the United States a few years ago, has established itself so firmly among *x*-ray workers that there is no need to enlarge on its advantages. Two varieties of tube are listed; the smaller, with a bulb only 3¼ in. in diameter, is specially for use in work requiring fine definition.

THE National League for Physical Education and Improvement, 4, Tavistock Square, has published a series of five leaflets intended to help parents who find it difficult to put their own thoughts into words to give elementary teaching in sex hygiene to their children. The tone is reverent and healthy, the wording simple, and the message seems to be plain enough for the purpose in view. There is no lack of such literature nowadays, but this little series will no doubt be welcomed by many parents.

IT is announced that grants from the Exchequer are now available in relief, or part relief, of the duties paid upon spirits used in voluntary hospitals. The grants are not available to institutions conducted for gain, and methylated spirits or spirits obtained free of duty under the Finance Act of 1902 are not to be included in the returns. The grants are in respect of spirits used solely for medical or surgical purposes, thus excluding brandy, whisky, and the like. Applications should be addressed to the secretary of the Local Government Board in London, or in Edinburgh, and returned not later than June 30th, 1917.

SIR OLIVER LODGE published some months ago a book entitled *Raymond, or Life and Death* which has had a very large circulation and is now in its seventh edition. It consists of two parts. The first contains an account of communications which the writer and other members of his family believed they had had with his son, who was killed in action in Flanders in September, 1915, at various dates beginning a few days after his death. The second part is a disquisition on the theories and methods of spiritualism. We understand that Dr. Mercier has now in the press a criticism entitled *Spiritualism and Sir Oliver Lodge*, and that the book is expected to be ready about June 21st.

THE annual meeting of the Poor Law Medical Officers' Association of England and Wales was held on May 9th at the offices of the Association, 34, Copthall Avenue, E.C., when the President, Surgeon-General G. J. H. Evatt, C.B., occupied the chair. The president and officers of the association were re-elected except the secretary, Dr. Major Greenwood, who had resigned in consequence of his serious illness, which has since proved fatal. Dr. A. Withers Green, 4, Wardrobe Place, E.C., was elected secretary, with Dr. Arthur Drury as literary adviser. The council amended the rules by authorizing the election of vice-presidents, and Dr. Balding (Royston), Dr. M. Greenwood (London), Dr. Jackson (Plymouth), and Dr. T. Gidley-Moore (Ongar) were chosen as vice-presidents.

IN his report for 1916 to the Board of Agriculture the assistant secretary of the animals division states that one outbreak of foot and mouth disease appears in the records, as against 56 outbreaks in 1915, and 27 in 1914. The number of outbreaks of anthrax confirmed bacteriologically during the year was 571, as compared with 575 in 1915. Of swine fever there were 4,331 outbreaks, as against 3,994 in 1915. A suspected case of rabies was disproved after full investigation. Forty-seven outbreaks of glanders and farcy, otherwise than amongst army horses, were reported to the Board, as compared with 49 in the previous year; of these 14 occurred in coal mines.

THE part which Brighton has played during the war in providing hospital accommodation for wounded Indian soldiers is well known. The buildings set apart for the Indians were the Dome and Pavilion, the Municipal Secondary Schools, and the Kitchener Hospital. Steps are now being taken to commemorate those who have given their lives for the empire. A committee for this purpose was formed, largely through the exertions of Sirdar Daljit Singh, and included among its members Sir Walter Lawrence, then Chief Commissioner of Indian hospitals, and officials of the India Office. We learn from the *Brighton Herald* that the committee has already raised a large sum entirely subscribed by Indians. A marble domed building will be erected, probably on the sea front, and the component parts will be carved in India by Indian craftsmen, and sent over to England in pieces. An appropriate memorial is also to be erected over the burning ghat on the downs. This *chatri* will form a permanent memorial in keeping with Indian sentiment.

A SECTION of the British Electrical and Allied Manufacturers' Association has been formed, enrolling British manufacturers of *x*-ray and electro-medical apparatus, with the object of improving the status and prospects of that industry by co-operation and research. As was pointed out in a recent discussion at the Röntgen Society on the future of the British *x*-ray industry (BRITISH MEDICAL JOURNAL, April 21st, 1917, p. 521), before the war the greater part of the *x*-ray and electro-medical apparatus used in this country was made in Germany and other foreign countries. Since 1914, however, great strides have been made by individual British manufacturers, and it is hoped that the enrolment of them as a section of the larger association will enable them to supply, not only the home trade, but the whole of the empire, and offer a means whereby the manufacture of British electro-medical instruments may be systematized and fostered. The section has lately co-operated with the Government in research work connected with the improvement of some essential instruments. It is hoped that this will be a preliminary to wider investigations, and the section invites the co-operation of medical men and hospitals.

Letters, Notes, and Answers.

AUTHORS desiring reprints of their articles published in the BRITISH MEDICAL JOURNAL are requested to communicate with the Office, 429, Strand, W.C., on receipt of proof.

THE telegraphic addresses of the BRITISH MEDICAL ASSOCIATION and JOURNAL are: (1) EDITOR of the BRITISH MEDICAL JOURNAL, *Aitiology, Westrand London*; telephone, 2631, Gerrard. (2) FINANCIAL SECRETARY AND BUSINESS MANAGER (Advertisements, etc.), *Articulate, Westrand London*; telephone, 2632, Gerrard. (3) MEDICAL SECRETARY, *Medisecra, Westrand London*; telephone, 2634, Gerrard. The address of the Irish Office of the British Medical Association is 16, South Frederick Street, Dublin.

The address of the Central Medical War Committee for England and Wales is 429, Strand, London, W.C.2; that of the Reference Committee of the Royal Colleges in London is the Examination Hall, 8, Queen Square, Bloomsbury, W.C.1; and that of the Scottish Medical Service Emergency Committee is Royal College of Physicians, Edinburgh.

☞ *Queries, answers, and communications relating to subjects to which special departments of the* BRITISH MEDICAL JOURNAL *are devoted will be found under their respective headings.*

QUERIES.

O. desires to find a home, preferably with a medical man, for the wife of a Belgian doctor now at the front and her daughter, 2½ years old. The lady is well up in bacteriology, and can perform Wassermann, T.B., and other tests.

PROTECTION FROM ULTRA-VIOLET LIGHT.

WE are asked what protection is necessary for the eyes and the rest of the body in working with an apparatus which produces ultra-violet rays quite exposed—that is, not in a lamp—working at 10 milliampères, say for thirty minutes at a time.

*** We have referred this question to Sir James Mackenzie Davidson, who writes: "Sir William Crookes invented a glass which prevents the passage of violet rays; the eyes can be protected with this glass, or lenses made with it in suitable spectacles or goggles. Opticians now supply spectacles with Crookes's glass when desired. Ordinary clothes and gloves will be ample protection for the body and hands. The face must have a mask made of any light fabric. It takes very little thickness of any opaque material to stop the passage of ultra-violet light." We may add that Sir William Crookes's investigation was made for the Glass Workers Cataract Committee of the Royal Society, to which society he communicated his results, after nearly four years' work, in November, 1913.

SCALE OF CHARGES FOR ADVERTISEMENTS IN THE BRITISH MEDICAL JOURNAL.

	£	s.	d.
Seven lines and under	0	5	0
Each additional line	0	0	8
A whole column	3	10	0
A page	10	0	0

An average line contains six words.

All remittances by Post Office Orders must be made payable to the British Medical Association at the General Post Office, London. No responsibility will be accepted for any such remittance not so safeguarded.

Advertisements should be delivered, addressed to the Manager, 429, Strand, London, not later than the first post on Wednesday morning preceding publication, and, if not paid for at the time, should be accompanied by a reference.

NOTE.—It is against the rules of the Post Office to receive poste *restante* letters addressed either in initials or numbers.